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THE AMERICAN ASSOCIATION OF GENITO-URINARY SURGEONS

FIRST DAY, MAY 26, 1924

SOME PROBLEMS OF CALCULUS OF THE LOWER URETER

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Indianapolis, Indiana

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The initial impulse to the present status of operation for stone in the lower ureter was given by the report of Young[1] in 1902 in which he included 4 cases. In 2 of these an extra-peritoneal uretero-lithotomy was performed through an iliac incision; in 1 a calculus was extracted from the ureteral orifice by ureter catheter manipulations, and in 1 a calculus passed spontaneously following ureteral catheterization. He was able to find in the literature at that time reports of only 5 cases of removal of calculi from the lower ureter by extra-peritoneal uretero-lithotomy, namely, by Twyman 1 case, Morrison 1 case, and Israel 3 cases. Prior to this time calculus of the lower ureter was held inaccessible except by intravesical operation or by Kraske's incision.

It is interesting to observe the strides made in the handling of this class of cases in the past twenty-two years by the development of cystoscopic methods and the perfection of technique of operation. Urologists at the present time are divided in opinion. There are those who favor intra-ureteral methods and who feel confident of success in a large per cent of cases of ureteral stones that are small enough to engage in the ureter; while those favorable to surgical removal regard the operation of uretero-lithotomy so easy of accomplishment that all stones which are not passed promptly after one or two ureter catheter manipulations should be operated.

[1] Young, American Medicine, August, 1902.

The presence of an obstructing calculus in the ureter predisposes to infection and tends to ultimate destruction of the kidney above unless it is passed or removed by operation. As soon as a renal calculus enters the ureter its problem becomes more complex and conservative treatment must be based upon the maintenance of ureteral drainage during the descent of the stone. The length of time one is justified in using intra-ureteral measures naturally varies in wide limits in different cases, and one's judgment must be based upon his experience in similar cases.

The comparative size of the calculus and that of the ureter as shown by primary radiogram and ureterogram, the shape of the calculus, the history of previous passage of urinary calculi, impairment of renal function, evidences of serious infection during attacks of ureteral occlusion, and the general physical condition of the patient are the factors for consideration in the individual case in deciding upon operation or persistence in intra-ureteral manipulation.

While conclusions founded upon the average may be formulated, they cannot be universally applied. Calculi of unusual size lodged in the lower ureter near the bladder almost always require operation, yet there are occasional exceptions.

If the size of the stone, as determined by the radiogram, is sufficiently small to permit of good drainage and there is definite clinical and radiographic evidence of progressive downward movement, intra-ureteral measures will succeed in accomplishing its passage in the majority of cases.

Caution must be observed, however, in dealing with a migrating stone, and especially should one not delay surgical removal when there is evidence of advanced pathology in the kidney above.

In impacted calculus, if intra-ureteral measures calculated to reëstablish drainage fail, in the presence of infection above, or when the condition of the opposite kidney is such as to render delay dangerous, the calculus should be removed by operation.

When a calculus obstructs one ureter and anuria occurs, if a single manipulation fails to establish drainage, surgical removal of the stone should be done at once. In the presence of

bilateral calculi, although intra-ureteral measures may result in some downward progress of the stone, sudden complete occlusion of both ureters may occur, producing a similar problem and surgical removal of the obstruction becomes imperative.

When operation for removal of a ureteral stone is undertaken, damage to the kidney on the corresponding side may be so advanced that nephrectomy is indicated, yet the condition of the patient or the degree of impairment of function of the opposite kidney may make the procedure inadvisable. In certain instances the apparent repair is remarkable in what seemed a hopelessly diseased kidney, after adequate ureteral drainage had been reëstablished through removal of the stone.

When nephrectomy is done in the presence of ureteral calculus the stone also should be removed, for if the calculus is allowed to remain it will tend to produce continued local pain and irritation of the lower urinary tract.

The conditions requiring surgical removal of a calculus are comparatively rare when the large percentage of calculi passed spontaneously or after intra-ureteral manipulations is taken into account.

In the use of intra-ureteral manipulations every precaution should be taken to safeguard the patient and one should be ready to operate on the first signs of renal damage or indications of exhaustion from pain. In some cases repeated efforts over a period of weeks may be required, and finally succeed, yet with unquestionable danger to the patient, when the calculus could be removed by a comparatively simple operation. That conservative treatment by intra-ureteral manipulations has a mortality is shown in the report of a case included herein.

It is the writer's purpose, in presenting this subject, to report a selected group of cases of calculus of the lower ureter with problems common to calculus in that location.

Case 1. Calculus of the lower ureter, with calculous pyonephrosis above, giant calculus of the opposite kidney, and stone in the bladder.

Mr. J. J., aged thirty-nine had for twenty years attacks of renal colic, bilateral, and passed several small urinary stones. The attacks were accompanied by dysuria and hematuria. The attacks became

more frequent and there was a progressive decline in the patient's health. When first seen, November, 1923, the patient was in an attack with pain and tenderness in the left loin and abdomen. His temperature was 100. There was a palpable swelling in the left loin, which was very painful to touch. The urine contained much pus and blood; the leucocyte count was 11,400 with 85 per cent polynuclears. A radiogram showed both kidneys to be enlarged, with a shadow occupying the entire right kidney pelvis and calyces and multiple shadows in the left kidney pelvis. In the left ureter, at the level of the upper segment of the sacrum was an elongated shadow 2 cm. in width. There was also a shadow in the bladder region 1.5 cm. in diameter (plate 1, fig. 1).

On November 20, 1923, by extraperitoneal uretero-lithotomy the stone was removed from the left ureter. A large amount of pus escaped through the ureteral incision. In a few days fairly clear urine drained and the wound was allowed to close. On December 12, 1923, a vesical calculus 1.5 cm. in diameter was removed by litholopaxy.

The patient had never been X-rayed until a few days before operation, yet for twenty years it was known that he had calculus disease. We still have the problem of bilateral calculi, for he has multiple calculi of the left kidney and a giant calculus of the right.

Case 2. Calculus of the lower ureter complicated by pyonephrosis above, giant calculus of the opposite kidney, and prostatic retention.

W. M., minister, aged sixty-two, was first seen August 2, 1921. His general health had always been good until ten years ago when he began getting up at night to void, but there was no day frequency or pain upon voiding. The night frequency gradually increased and three years ago he developed pain in the region of the kidneys, first in the right side and later in the left side. The left renal pain became severe and required morphia to relieve. There was residual urine and cystoscopy disclosed a lateral lobe hypertrophy of the prostate. X-ray showed a large stone occupying the entire right kidney pelvis, and a shadow 2 cm. long and 1 cm. wide, opposite the lower third of the sacrum on the left side (plate 1, fig. 2). The left ureter was obstructed at this point. The total phthalein output was low. Complete retention followed cystoscopy and catheterization was difficult. Vesical drainage became imperative. The hypertrophied prostate

was removed by suprapubic two-stage operation. The patient recovered slowly and was allowed to go home December 2, 1921. He was able to empty his bladder and was gaining in health.

In July, 1923, the patient returned because of recurrent attacks of left renal pain and a gradual decline in strength. On August 6, 1923, the calculus in the left ureter was removed through an extra-peritoneal iliac incision under local anesthesia. Thick pus drained from the tube in the ureteral incision for a time but soon cleared and the urine was of remarkably good quality.

This patient had an inoperable calculus disease of the right kidney and marked impairment of the left, from obstruction of the ureter, yet was able to go through the operation of prostatectomy from which he emerged much improved. The improved bladder drainage doubtless saved his remnant of renal tissue.

Case 3. Impacted calculus of the lower left ureter with hydronephrosis above and calculus disease of the opposite kidney and migrating calculus of the right ureter.

Mr. D. R., aged fifty-one had poor health in early life and at the age of twenty-five had pulmonary hemorrhage, but apparently recovered from this infection. Two years ago he began having attacks of right renal colic and six months later passed a calculus. When first seen, January 12, 1923, he was complaining of lower abdominal discomfort with pain referred to the bladder and perineum. Shortly afterwards he had pain in the left kidney region. A radiogram showed several calculi in the right kidney and one in the left ureter at the level of the left sacro-iliac joint. A ureteral bougie was obstructed at this point but the obstruction was passed. The patient had a severe reaction following cystoscopy and was sent home for preparation for surgical removal of the stones. Repeated radiograms were made of the left lower ureter and the shadow remained at its original location (plate 1, fig. 4). On July 27, 1923, following an attack of pain in the left lower abdomen accompanied by a chill, the temperature mounted to 104 and he was in distress for four days. During this time he had an appreciable lessening of his urinary output. On July 31, he again entered the hospital, and a radiogrm taken August 4 showed the calculus in the left lower ureter, multiple shadows in the right kidney region and a small shadow in the lower right ureteral

area opposite the mid-section of the sacrum. This had not appeared on the former plates. On August 11, the stone was removed from the lower left ureter through an extraperitoneal iliac incision. The patient's progress was satisfactory but urine continued to escape from the wound and on September 6, an attempt to pass a catheter up the left ureter failed, and no fluid could be injected beyond the point of obstruction which was about 11 cm. from the bladder. On September 15, the sinus was injected with 20 per cent NaBr solution and a left pyelogram obtained which showed a greatly dilated kidney pelvis (Plate 1, fig. 4). The phthalein output from the left kidney, through the wound, was 9 per cent for two hours while from the right kidney it was 55 per cent for the two hours. Between September 17 and 24 he must have had the first attack of retention on the right side for on September 25 to meet this emergency, both ureters were catheterized and an obstruction was encountered on the right side low down which was passed when urine flowed from the ureteral catheter in a stream until 25 cc. was collected. The left ureter was now catheterized without difficulty, and the catheters were anchored in both ureters. On September 30, upon withdrawing the right catheter a small calculus was pulled into the bladder and removed by an evacuator. A radiogram, September 29, showed a shadow located as formerly in the lower right ureteral area (plate 1, fig. 3). By placing the patient in Trendelenburg position, ureteral manipulation succeeded in dislodging the stone and it was pushed upward to the level of the transverse process of the fifth lumbar vertebra. On October 3, in the same manner the stone was pushed into the kidney pelvis. The catheter was anchored to prevent the escape of the stone and by right nephrolithotomy, 3 stones were removed. On October 17, a radiogram of the right kidney region showed a comma-shaped shadow evidently the same as had formerly been found in the lower right ureteral region, located in the upper pole area of the right kidney. On October 24, the drainage catheter was removed from the right kidney, the right ureteral meatus was incised and the lower ureter dilated for 3 or 4 cm. with the Lewis dilator. A radiogram now showed the shadow opposite the third lumbar vertebra. The next morning the patient had an attack of acute pain in the right lower abdomen and a catheter again met obstruction in the right ureter about 4 cm. from the bladder. The obstruction was passed without dislodging the stone. The catheter was anchored in place. Radiograms made daily showed changes in

the shadow evidently due to rotation of the stone and on October 30 the stone passed into the bladder and was removed with Young's rongeur.

The patient is entirely comfortable and enjoying excellent health. His urine is somewhat cloudy with pus but is of good gravity and free from albumin. The phthalein output recently was 48 per cent, doubtless mostly from the right kidney, yet we feel that the left kidney with its greatly reduced function enabled the patient to undergo the process of ridding the right of its menace of stone.

The question of which side to operate first in bilateral calculi was decided in this case upon the assumption that the more involved left kidney might still be capable of regeneration and bring support in the problem of dealing with the opposite kidney which was less diseased.

Case 4. Involvement of the left side in multiple calculi of the lower ureter, impacted calculus of the mid ureter and renal calculi.

Mr. F. D., aged forty-one, had his first attack of renal colic in 1917. He has since passed six urinary stones. These were accompanied by colic in both the right and left sides. In October, 1922, he had two stones removed from his right kidney. When he came to us in April, 1923, he was complaining of frequent urination and pain in the abdomen. His temperature was 102. A radiogram showed multiple shadows in the left renal area and a mass of seven or eight shadows in the lower left ureteral region; a large triangular shadow nearest the bladder with several small shadows just above it (plate 1, fig. 5). At cystoscopy an obstruction was met in the lower left ureter 1.5 cm. from the bladder. The orifice and lower ureter were dilated with a Lewis dilator as far as the point of the obstruction, and three days later the stones passed into the bladder, six being passed voluntarily from the bladder; the seventh and largest was removed with Young's rongeur. The patient then left the hospital but returned for treatment of his urinary infection and observation to see what could be done with his left renal calculi. Upon ureteral catheterization an obstruction was met in the left ureter at 12 cm. from the bladder which could not be passed. Radiograms did not show a shadow at this point. Attempts to pass the obstruction on subsequent occasions failed. No scratches could be secured upon a wax bulb, no fluid could be forced by the

obstruction and indigo-carmine failed to appear from the left kidney. The shadows in the left kidney region remained the same and no shadow was shown on any plate at the point of obstruction in the left ureter. On February 9, 1924, left nephro-lithotomy was performed. An incision was also made into the left ureter below the pelvis and the obstruction was found to be due to a stone, which was crushed in an attempt to grasp it with ureter forceps, and the fragments were pushed into the bladder. Convalescence was uneventful and on March 3, 1924, and on April 10, 1924, the left ureter was catheterized and the kidney pelvis lavaged. The infection in the left pelvis is improving and there is now established good drainage on this side.

In addition to the calculi of the lower ureter there was an obstruction in the mid portion of the ureter with complete occlusion.

The character of the obstruction and the renal damage is produced it could not be determined before operation. The operation of nephro-lithotomy rather than nephrectomy was decided upon after removal of the ureteral stone.

Case 5. Calculus of the left ureter protruding into the bladder with a large knob-like formation within the bladder and calculus pyonephrosis above.

D. H., aged thirty-three. Admitted to the hospital February 18, 1922. His general health had always been good until 1918 when he was wounded by a machine gun bullet splintering the bones of the left leg. Several pieces of bone were removed at intervals following the injury. While still in a government hospital in 1920 he developed an attack of pain in the left kidney region. In a few months the pain recurred and the attacks increased in severity and frequency and at times pain was referred to the bladder and left testicle, sometimes accompanied by nausea and vomiting. Urination was frequent and there was hematuria at times. The left kidney was tender on palpation. The phthalein output was 45 per cent in two hours.

A radiogram showed a large calculus filling the left kidney pelvis and two shadows in the lower left ureteral area (plate 2, fig. 6).

Cystoscopy disclosed a stone, protruding from the left ureteral orifice into the bladder, which could not be dislodged by intravesical manipulation. It appeared to be about 2 cm. in diameter as it projected into the bladder.

On February 21, 1922, by suprapubic cystotomy the projecting calculus was dislodged from the left ureteral meatus and removed. The dilated ureteral orifice was large enough to admit a Blake gall stone forceps by means of which the stone was removed from the lower ureter.

A month later a left lumbar nephrectomy was done for calculous pyonephrosis.

In this case the fragment of calculus was removed from the lower ureter via suprapubic cystotomy without difficulty and this fact suggests that the procedure may occasionally be indicated.

Case 6. Giant calculus of the lower ureter with calculous pyonephrosis above.

Mrs. M. M., aged thirty-eight. Admitted to the hospital November 11, 1922. She had always been free from urinary disturbance until six years ago when, following childbirth, she developed bladder trouble. Three years ago she had an attack of left lumbar pain followed by the passage of urinary calculi. Since that time she has had similar attacks of pain but passed no more stones. There was constant blood in the urine and a hard tumor mass could be felt in the left iliac fossa. Her phthalein output was 75 per cent. The left ureter was obstructed at 8 cm. A radiogram showed multiple shadows in the lower pole of the left kidney and a large, irregular shadow in the lower left ureteral area (plate 2, fig. 7). On December 14, 1922, the kidney and ureter were removed by transperitoneal nephro-ureterectomy by Dr. W. D. Gatch. On opening the abdomen the kidney was found to be a thin-walled sac containing purulent fluid and several calculi. The enlarged ureter was traced down to the site of the calculus, below which it was ligated and severed and the kidney and ureter removed. Rubber tissue drainage was inserted through a stab wound in the loin and the abdominal wound closed.

The patient had a stormy convalescence, requiring transfusion on the tenth day after operation. Infection developed in the wound which drained for several weeks. After the transfusion she gradually improved and made a good recovery.

Case 7. Spiculated calculus adherent within a dilatation of the lower ureter.

Mr. A. B. A., aged fifty-three. General health had always been good until July, 1910, when he had a brief but sharp attack of left

abdominal pain followed by nausea. A month later he had a second attack of longer duration and located somewhat lower in the abdomen. Following this attack he complained of discomfort referred to the genitals and sacral region. In November, 1910, he had a third attack of left abdominal pain which required morphia. A diagnosis of left ureteral calculus was made elsewhere and at operation the calculus could not be found. Following this operation he continued to have occasional recurrences of left abdominal pain referred to bladder and testicles, accompanied by chills and fever and cloudy urine. In February, 1921, ureter catheterization detected an obstruction in the left ureter 3 cm. from the bladder. A wax bulb showed multiple scratches and X-ray showed a shadow in the region of the lower left ureter which was incorporated in a localized fusiform dilatation of this portion of the ureter as visualized in the ureterogram. The stone was lateral to the channel proper and pocketed in this dilatation. Repeated ureteral dilatations with ureteral meatotomy failed to dislodge it and on August 4, 1921, the stone was removed by extra-peritoneal uretero-lithotomy.

This stone was fusiform in shape, spiculated and adhered to the uerteral wall. Ureteral manipulations could not have succeeded.

Case 8. Migrating calculus of the lower ureter.

Mrs. C. R., aged twenty-nine, was admitted to the hospital September 9, 1921. One and one-half years ago, when convalescing from influenza and left-sided pleurisy, the patient developed chills and fever with pain in left loin which continued three weeks. She was then comparatively free from pain for six months when she again developed pain in the left loin radiating downward along the course of the left ureter. There were no bladder symptoms. Both ureters were catheterized and no obstruction was found. The urine from the left kidney showed many pus cells. Thirty-two per cent phthalein was excreted by the right kidney and 10 per cent by the left kidney in fifteen minutes. A radiogram showed a shadow 1.5 cm. in length in the lower left ureter (plate 2, fig. 9). The kidney pelvis and ureter were moderately dilated. A radiogram December 22, 1921, showed the stone at a higher level in the ureter. Having determined that the stone was a migratory one it was removed by extraperitoneal uretero-lithotomy.

Case 9. Unusually large ureteral calculi of the lower ureter passed spontaneously after ureteral meatotomy, and aided by rectal massage.

Mr. J. M. B., aged forty-two. Since the age of seventeen, had passed numerous calculi, and on account of chronic renal infection, was under observation at irregular intervals for renal lavage. In May, 1922, he had pain in the right kidney region. A ureter catheter was obstructed at about 20 cm. He was not seen again until September, 1923, just after an attack of colic on the right side. X-ray examination showed two large stones in the lower right ureter just above the bladder (plate 2, fig. 10). The ureteral orifice was enlarged with cystoscopic scissors and rectal massage given in an effort to dislodge the calculi. Shortly afterwards one of the stones passed into the bladder and was removed by litholopaxy. A month later, following a severe attack of colic, the second stone was passed into the bladder and it also was removed by litholopaxy.

Case 10. Migrating calculus treated by intraureteral manipulation, death, autopsy.

Mr. G. M. C., aged fifty-six. Admitted to the hospital October 10, 1921. At the age of forty-one, he had an acute attack of pain in the right abdomen which lasted but a few days. Just before admission to the hospital he had an attack of pain in the right loin, extending into the right groin. The pain was sharp, lasting only a few hours, but recurred next day in a similar location and of the same character. When first seen, the patient was in an attack of abdominal pain referred to the right lower quadrant. There was some tenderness and muscular fixation in this region, the remainder of the abdomen being negative. Urination had increased in frequency. The temperature varied from 99 to 100, the white blood count was 11,000. The urine was of low specific gravity and showed a marked trace of albumin and many pus cells. A radiogram showed a shadow 0.5 cm. in diameter opposite the right transverse process of the fourth lumbar vertebra (plate 2, fig. 11). A ureter catheter was obstructed at this point. Albolene was injected into the ureter. The attack gradually subsided. On October 22, 1921, there was no tenderness of the abdomen. X-ray showed the calculus in the kidney pelvis. The patient then had another attack of right abdominal pain with elevation of temperature and marked reduction in urinary output. The urine October 26, 1921, showed ++++ pus and blood and a large quantity of albumin. He began hiccoughing. X-ray showed the former shadow to be about 4 cm. from the bladder. A catheter was passed to the kidney and anchored. Hiccoughing ceased in twenty-four hours, the pain sub-

sided and the patient's general condition was improved. On October 28, the ureter was again dilated and the catheter anchored. On November 1, he was comfortable and in good condition; tongue moist, urinary output satisfactory and mentality alert. On November 7 the ureter was dilated with a bougie and two catheters were anchored in the ureter. The X-ray showed no shadows in the lower ureters. On November 9, we again dilated the ureter and reanchored catheters. On November 13 the patient began to fail, the heart became rapid, the temperature mounted and the abdomen became rigid and tense, and the patient died November 16, 1921.

Autopsy disclosed an acute peritonitis with free pus in the peritoneal cavity, more in the right side of the abdomen, centralizing about the right kidney. The right kidney was firmly adherent and there was pus in the renal fossa. The pelvis was incased in a thick layer of adherent fat. The right kidney, right ureter and the right half of the bladder were removed together. The kidney was pyonephrotic with multiple abscesses in its substance, but there was no demonstrable evidence of rupture of a cortical abscess upon its surface. No tear or abnormal opening could be demonstrated in the ureter or pelvis. The ureter was dilated except near the bladder and contained a small calculus which was freely movable throughout the length of the ureter.

This case illustrates some of the difficultes encountered in dealing with migrating calculus and emphasizes the danger of intra-ureteral manipulations in the presence of stones of this character.

Fig. 1

Fig. 2

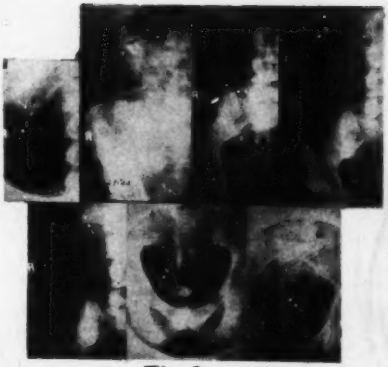

Fig. 3

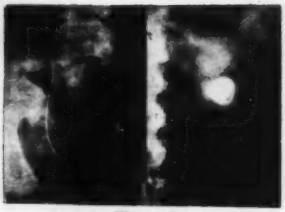

Fig. 4

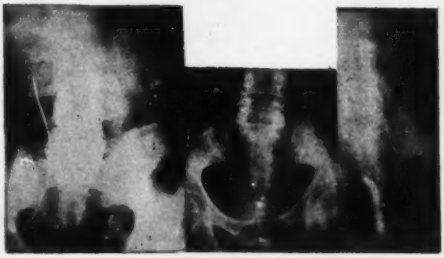

Fig. 5

Fig. 6

Fig. 7

Fig. 8

Fig. 9

Fig. 10

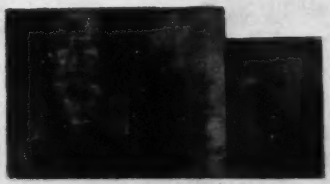

Fig 11

URINARY REFLUX

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The last few years have witnessed a never increasing interest in the ureter. Valuable contributions have appeared concerning not only its various pathologic changes, such as strictures and dilatations, but dealing with its anatomic and histologic structure and physiologic functions. In 1920, Wislocki and O'Conor published their experimental observations on the ureter with especial reference to peristalsis and antiperistalsis. In 1921, Quinby reported to this Society his observations on the physiology and pathology of the ureter, and the following year Caulk discussed the importance of the ureterovesical valve in a case of megalo-ureter. Last year, by invitation, Graves and Davidoff presented their studies on the ureter and bladder with especial reference to urinary reflux. Sampson, following a very careful series of experiments on dogs, did not see reverse peristalsis occur, and Graves and Davidoff, working with rabbits, confirm this view. They found it in no way concerned with urinary reflux. As a result of this wealth of experimental work, various rather definite conclusions and several interesting theories have been reached.

The intravesical portion of the ureter, if it is involved in an inflammatory process in the bladder, becomes a more or less rigid tube, and being unaffected by various contractions of the bladder, ceases to function as a valve. A like condition is produced when it is split for the purpose of removing a stone. All means of preventing a reflux of urine from the bladder to the kidney, except the

peristaltic pressure of the urine coming from the kidney, is then removed. Draper and Braasch, after a series of experiments on dogs, concluded that "protection from reflux is affected at least as much by physiologic function of the ureter as by the check-valve action at the meatus. These together, rather than the ureterovesical valve alone, constitute the factor of safety which prevents reflux". Others, including Sampson, however, insist that the peristaltic force can be easily overcome by the forcible contraction of the bladder, while Graves and Davidoff have suggested that the contraction force of the bladder may even produce reflux in the presence of normal ureterovesical valves in man, as it did in 73 per cent of their rabbits. Proponents of this view give as an illustration the common clinical observation that following the removal of a cystostomy drain, a patient is often seized with a sudden febrile reaction. This is interpreted as being due to the forcing of infected contents of the bladder into the renal pelvis by sudden contraction of the bladder with resulting pyelitis, but is not believed to be possible so long as a more open outlet is afforded by the suprapubic drain.

If reflux occurs in man, the acute type must be distinguished from the chronic condition in which the contents of the bladder freely regurgitate to the renal pelvis through ureters the entire length of which are dilated. It occurred to me that a more thorough study of the chronic condition might add information of value to the hypotheses now held with regard to acute reflux, and moreover, that it would be of interest to know more accurately how frequently such chronic reflux occurs, and what bearing its presence may have on renal function. With this end in view 1036 cystograms were reviewed, and reflux was found to have occurred in one or both ureters in 89 cases (8.59 per cent). It was present in both ureters in 33 of the cases, in the left in 29 and in the right in 27.

Quinby has suggested that acute reflux may explain the occurrence of "back pressure" in patients, with prostatic disease, since he does not believe it possible to explain, in a physical sense, this phenomenon when the ureterovesical valves are competent and the ureters are not dilated. While on first thought it would

seem probable that obstruction in the lower urinary tract, such as prostatic hypertrophy, would favor ureteral dilatation, it appears not to be the case, for in this study 527 cystograms of patients with hypertrophy of the prostate were reviewed, and in only 4.74 per cent was reflux present. This low percentage would seem to bear out Quinby's assertion that "so far as I have investigated the question in the absence of infection, obstruction by the prostate does not carry as a necessary consequence any abnormality of the ureters".

The close relationship between infection and urinary reflux is evident in the study of its occurrence in various groups of urinary disease. It occurs with tuberculosis in 38.88 per cent, with resection of the bladder in 33.33 per cent, with pyelonephritis in 18.96 per cent, with stricture of the urethra in 11.62 per cent, after prostatectomy in 11.42 per cent, with disease of the central nervous system in 11.34 per cent, with tumors of the bladder in 7.54 per cent, with hypertrophy of the prostate in 4.74 per cent, and with diverticula of the bladder in 2.38 per cent. I have not known it to occur if the bladder was normal, except in children.

The incidence of reflux is the highest with tuberculosis, while with pyelonephritis it is far in excess of all other urinary diseases uncomplicated by surgical measures. It seems fair to assume that when the infection originates in the kidney, the upper portion of the ureter first becomes involved in the inflammatory process, and its gradual dilatation results. As the lower portion of the ureter is involved last, the intramural portion and the ureterovesical valve remain normal for some time. This normal caliber, while previously sufficient adequately to drain a ureter with normal tone and peristalsis, now, in comparison to the chronically dilated ureter with diminished tone and poor peristalsis, acts as an obstruction and tends still further to cause dilatation of the ureter above. If this assumption is correct, it would explain the frequent occurrence of normal small ureteral orifices in ureters with inflammatory dilatation in cases of pyelonephritis.

Carrying this thought a step further it may be assumed that, if the bladder is the primary seat of infection, the intramural

portion of the ureter will be involved initially, and being rendered rigid and noncollapsible, the ureterovesical valve will cease to function and the intravesical pressure, with the infection, will tend to dilate the ureter from below upwards. In such cases the incidence of ureteral reflux should be high and occur early in the course of the disease, while if the infection originated in the kidney it should be lower in percentage of occurrence and occur only late in the course of the disease. Thus we have an explanation for the ocurrence of reflux in 33.33 per cent of cases of resection of the bladder, a procedure necessarily associated with much vesical infection.

The greatest incidence of reflux with tuberculosis, which invariably is renal in origin, would at first seem like a paradox, yet the fact that cystitis occurs early is sufficient reason for it. The cystitis invades the wall of the bladder deeply, involves the intramural portion of the ureter, and gives the characteristic golf-hole appearance to the orifice. The changes arising in the bladder may occur also around the ureter from the sound kidney. In such a case, the golf-hole orifice is noted on the side in which renal function is normal and renal infection absent, and reflux to the good kidney occurs.

The fact that chronic urinary reflux is invariably associated with marked urinary infection stimulates interest in the effect on renal function of this constant back wash of infected urine from the bladder. It might be expected that in a group of such cases there would be rather decided eivdence of renal impairment.

Twenty-five of the 527 patients with prostatic hypertrophy had reflux. In 8 it occurred in both ureters, in 9 in the right only, and in 8 in the left. These patients had had symptoms of urinary trouble for an average of four years, and yet the indications of renal impairment were surprisingly few. The urea content of 100 c.c. of blood averaged 43 mg., the highest value being 104 mg., and the test of renal function by means of phenolsulphonephthalein excretion for two hours averaged 38 per cent; values that are remarkably low for this group of patients. The systolic blood pressure in this group averaged 147 and the dias-

tolic 88, clear evidence that the reflux had produced little appreciable general effect.

In the group of patients suffering with pyelonephritis the findings were similar. Of 116 patients studied, reflux occurred in 22; in 14 in both ureters, in 3 on the left side alone, and in 5 on the right side only. In this series the average duration of disease was eight years, twice as long as in the patients with prostatic disease. The urea content of the blood averaged 35 mg. for each 100 c.c., and the phenolsulphonephthalein output for two hours averaged 40 per cent. The average blood pressure was 129 cystolic and 82 diastolic.

A review of the remaining groups would be tedious, especially as the results are similar. Suffice it to say that of the 89 patients who had chronic reflux, the average duration was six years, the average urea content of the blood 40 mg. for each 100 c.c., and the average phenolsulphonephthalein output for two hours 40 per cent. The average systolic blood pressure was 136, and the diastolic 83.

Evidently, then, chronic urinary reflux does not in itself impair renal function, and when discovered, should not be interpreted as indicative of advanced renal disease. For it may happen that due to the dilatation of the ureter the split functional test from the side with reflux will be low, and this fact together with the dilated ureter be interpreted as indicative of advanced disease. Similarly, if urography is not carried out, the low return from the side with urinary reflux may be interpreted erroneously. The importance of adequate urography, however, is best illustrated in cases in which reflux is most common, namely, in cases of tuberculosis. The treatment of tuberculous cystitis after the removal of the infected kidney by lavage with increasing strengths of phenol as described by Rovsing, has proved very gratifying, but if there is chronic reflux in the remaining kidney, great harm may result without proper care in administering the phenol to prevent its reflux to the kidney. Therefore, it would seem imperative that routine cystograms should be made in cases of tuberculous cystitis, at least prior to such treatment.

CONCLUSION

Chronic urinary reflux occurs in approximately 8 per cent of patients with disease of the urinary tract. The reflux seems to bear a direct relationship to urinary infection, and is not influenced by obstruction in the lower urinary tract. It does not affect renal function, but in its presence, care should be taken with regard to the type of lavage solution employed in treating the bladder.

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DISCUSSION

Dr. GEORGE WILLIAM WARREN (New York): I have had recently a case of stone in the ureter with a very unusual blood picture. Cystoscopically the bladder was normal. The urine from the right ureter had no specific gravity and contained no urea. The left ureter was completely occluded by a stone. X-ray showed a large right kidney with seven stone shadows. The left kidney showed a shadow of a stone in the ureter. He was passing 40 to 60 cc. of urine a day with practically no specific gravity and no urea. Blood chemistry at this time:

Urea nitrogen	72 per 100 cc. of blood
Non-protein nitrogen	100.5
Uric acid	8.4
Creatinin	5.1
Sugar	0.16 per cent

At operation I removed a stone from the left ureter. On the same day the twenty-four hour urine contained 3 grams of urea. His urinary output increased so that on the second day he passed 700 cc. of urine. In forty-eight hours after the operation the twenty-four-hour urine contained 18 gram of urea. Five days after the operation his urinary output for twenty-four hours was 2775 cc. with 32 grams of urea. The blood chemistry on the fourth day after the operation showed a urea nitrogen of 14 and a creatinin of 2.1. Seven days after the operation the urea nitrogen was 19.5, creatinin 1.55, the CO_2 combining power was 54.5 to 100 cc. of blood. These figures were within normal limits.

This is the first case in my experience where a high creatinin content of the blood was reduced almost at once by relieving the kidney blockage. This case is of interest in relation to the reabsorption of urine from the pelvis of obstructed kidney as pointed out by Dr. Hinman's work.

Dr. J. Dellinger Barney (Boston): I was much interested in Dr. Bumpus' paper because we have been trying to find out the cause, so far as we can, of the kinks of the ureter which are seen so frequently. In an effort to explain them I did some simple experiments with a rubber tube, tying off one end of the tube and injecting the other with water by a hand syringe. I laid the tube on the floor and put on as much pressure as it would stand, and as the tube became full and over-distended it began to curl in the way you see ureters curl in these cases of ureteral kink, and while I have no proof at all, it is my idea that in some of these cases the ureteral kink is due to ureteral reflux which over-distends the ureter.

Dr. Francis R. Hagner (Washington, D. C.): I believe some of the older members will recall that about twenty years ago I reported a case of reflux during ureteral catheterization, and I believe that was the first time it was noted. I have been watching that for many years, and it is really quite a common thing. I believe that all these cases that have ureteral reflux following catheterization have patulous ureters. If a cystogram is done they will show reflux from bladder or kidney. All of these cases have diseased ureters or ureteral opening. The opening is inflamed and infected and we have the same condition as Dr. Bumpus has spoken of. I believe there is another condition in which it is very common, and that is in malignant tumor of the bladder, especially if the ureter itself is not involved. I have watched some of these cases and almost all of them have ureteral reflux.

Dr. Benjamin S. Barringer (New York): I think most of us have observed that urinary retention rarely complicates, but that in a good many cases there is a reduced kidney function. I think one-third of our cases have reduced function of the kidney, but now I am entirely lost because Dr. Bumpus says they all have urinary reflux, but they do not all have reduced kidney function. I was in hopes he would explain why we have reduced function in carcinoma of the bladder without urinary retention.

Dr. JOHN H. CUNNINGHAM (Boston): I like the position Dr. Hamer has taken in regard to the problem of stones in the ureter. I think we have perhaps been a little too enthusiastic about non-operative methods for the removal of these stones. It has been fascinating to remove them by cystoscopic manipulations, and I agree that we have been successful in the majority of instances. On the other hand, I cannot help but feel that surgery is frequently indicated and has a definite place in the treatment of ureteral stones which do not pass with a few attempts by intra-ureteral manipulations.

I cannot help but feel that this Society, and other urological societies, have emphasized perhaps too much the intra-ureteral manipulations to the neglect of surgery. I heartily endorse the position that Dr. Hamer has taken in this matter.

Dr. Bumpus' paper shows a splendid piece of work, but there are many features that we will have to digest before we can appreciate the work that has been done. I rather infer that he believes we can get a reflux on the normal side in certain diseases of the bladder. That I believe to be a fact. I believe that the work that Graves presented to the Society last year, and the work of other observers leads us to believe that with a spasm of the bladder, produced by some lesions within it that we may get a regurgitation on the normal side. Of course, we all appreciate the other forms of regurgitation that Dr. Hagner spoke about, where the ureteral orifice is opened through disease.

I was especially pleased to hear Dr. Bumpus speak of the tubercular bladder as being the cause of reflux on the other side. I recall one patient with renal tuberculosis, upon whom I did a nephrectomy and ureterectomy, with the bladder markedly involved, and a tubercular stricture of the ureter. We gave this patient phenol lavage for the bladder tuberculosis, which caused an unusual degree of bladder spasm, as is so frequently the case. He developed an early tuberculosis of the remaining kidney, and I am inclined to believe it was due to the reflux of the tuberculous bladder urine because of this spasm.

I would like to have Dr. Bumpus, in closing, state his belief as to whether or not tubercular bladder involvement or spasm, pro-

duced by phenol lavage, may be a factor in producing reflux on the normal side. Personally I believe it to be the case.

Dr. ARTHUR L. CHUTE (Boston): In regard to stones in the ureter, it seems to me if a man with a stone in his ureter is running a temperature and has a turbid urine, or if he has a large, tender kidney, it is no time to try manipulation; we should go ahead and remove the stone at once. If, on the other hand, the patient is without acute symptoms and the stone is small, we should try conservative measures.

Dr. Hamer has referred to something I have noticed a number of times, and that is the little spicules on certain of these stones which, although small, are held low down in a ureter. These little spicules become caught in the thickened ureter wall and I do not believe one can ordinarily remove them unless one cut down upon them; not long ago I saw such a stone impacted in the lower end of a ureter that had led to the destruction of its kidney.

Dr. Hamer spoke of the perforating wound in the case where he found pus about a kidney. I had a tuberculous ureter perforate in passing a ureter catheter; at autopsy we found quite a collection of pus about the point of perforation.

The description of Dr. Bumpus' patient is interesting. I have noticed, particularly in cases where we have resected the bladder for malignant disease that we are very apt to have some ureteral reflux. I have supposed in some cases that it was due to induration and thickening of the bladder wall in the region of the ureter that interfered with the ureter's ability to close itself, that in other cases it was the result of scarring of the bladder which pulled the ureteral meatus open. I was interested to hear Dr. Bumpus express the opinion that infections of the ureter often begin above and progress downward and that the dilatation of the ureter is secondary to the inflammatory condition. It seems to me that many of these cases of dilated ureter are not the result of a stricture but from infection beginning above; and what is thought to be a stricture, that has caused the dilatation, simply represents the point of junction of the diseased, dilated part of the ureter and the normal ureter. I believe conditions of this

sort are often described as strictures of the ureter. The so-called stricture is simply the point of junction of the upper diseased and dilated part of the ureter and the normal, lower part. The vague symptoms these patients have are, I believe, due to their ureteritis rather than to any obstruction.

Dr. WILLIAM F. BRAASCH (Rochester, Minn.): I daresay most of us will recall the discussion we had last year concerning stones in the ureter. I think we all agreed that the pendulum had swung too far towards manipulation and away from operative surgery. However, in the presence of Dr. Crowell I hesitate to criticise because he has been so uniformly successful with stone manipulation. It has been our experience that complications following cystoscopic manipulation for stone in the ureter are occasionally more serious than any which are observed following operation. Severe reactions, accompanied by fever, chills and prostration are not at all uncommon following manipulation, necessitating immediate surgical drainage and removal of the stones. Large, rough stones, particularly when situated at some distance above the bladder, frequently require repeated manipulation over a period of many weeks or months before the stone is passed, and could be removed much more quickly by ureterolithotomy.

In regard to stricture of the ureter, I am frank to confess that my opinion concerning the incidence of stricture has changed somewhat. Hunner deserves much credit for calling our attention to the fact that ureteral strictures occur more frequently than was formerly supposed. It must be remembered, however, that dilatation of the ureter may result from either stricture or inflammation or from both factors. Although I am free to admit that stricture of the ureter occurs more frequently than I had supposed, nevertheless I do not think it occurs with the marked frequency that some observers would lead us to believe, and it is rarely an etiologic factor of ureteral stone.

Although ureteral reflux is usually possible because of inflammatory dilatation of the lower ureter, other factors may be present. In occasional cases of urinary reflux a lesion of the nerve supplying

the lower ureter may be the cause of relaxation. However, in a majority of cases it is due to inflammatory dilatation of the uerter of ascending origin. I do not believe that ureteral reflux frequently observed in a tuberculous bladder permits of an ascending renal tuberculosis. Peristalsis in the upper portion of the ureter is usually sufficient to protect the kidney.

Dr. ALFRED T. OSGOOD (New York): If I am not mistaken Dr. Bumpus definitely reports that the acute cases with spasm are those which show a large percentage of reflux. That seems to me quite important. We hear from Dr. Barringer that a large number of cases of carcinoma of the bladder have reflux. Cases of stricture of the ureter are reported with reflux. I think the important thing is, as Dr. Quinby shows, that an acute spasm and hypertension of the bladder is the cause of reflux in a great many cases.

Dr. HERMAN L. KRETSCHMER (Chicago): Much of the interest in the subject of the treatment of stones in the ureter has been due to the institution of the various non-operative measures of treatment by the urologists. I have always assumed the attitude that the patients suffering from stone in the ureter should be given the benefit of the various methods of ureteral manipulation. There are cases, as Dr. Hamer has shown—cases of very large stone that are clearly surgical cases right from the start. I have always felt that if one sticks to it long enough one can get most of the stones to pass, even some that appear to be too large to pass. We should bear in mind the early reports of Dr. Leonard of Philadelphia, some twenty-five years ago, who showed that about 25 per cent of stones passed unaided. I think we have all had cases such as the cases mentioned by Dr. Chute. I believe that this type of cases should be treated surgically.

The complications that Dr. Hamer has referred to I think are very timely. I remember one case in the patient at the hospital had a ureteral stone on one side. The stone completely blocked the ureter so no urine was obtained upon repeated catheterization. It was decided to oil the stone on the opposite side and after

several manipulations the stone migrated down the ureter and it, too produced a complete block, so that both ureters were completely blocked by stone.

The subject of migration of stones is a very important one and we must not lose sight of the fact that some of these stones are capable of retrograde migration. One instance in which the patient was under observation for five years, the stone remained in his pelvic ureter during all of this time. Several attempts to aid the stone in its passage were unsuccessful and the patient finally consented to operation. An X-ray was taken just before the anesthetic was started. Much to our surprise we found that the stone had wandered back up into the region of the third lumbar vertebra. So now I make it a rule of taking a picture just before the anesthetic is started in every case upon which I operate for stone in the ureter.

I have recently been making pyelograms before operation in all of our cases requiring ureterotomy for stone, in order to determine the amount of kidney destruction that has occurred. If there is only a moderate amount of destruction, we do a ureterotomy and remove the stone. If, on the other hand, a good deal of destruction is present, we plan to do a nephroureterectomy.

Dr. A. J. Crowell (Charlotte, N. C.): I do not care to discuss these papers, but wish to correct an impression that seems to have gotten abroad that I am opposed to operating for ureteral stone under any condition. Like Dr. Kretschmer, I believe every patient should have the advantage of an attempt to remove these stones by cystoscopic manipulation. Should failure occur, no harm has been done the patient and the stone can be removed just as easily by operative surgical procedure thereafter. I think it is a mistake to persist in attempts to remove a large stone from the upper portion of the ureter in the presence of a virulent infection. If we are unable to get kidney drainage in the presence of a virulent infection immediate uretero-lithotomy should be resorted to. In the lower end of the ureter we are justified in making persistent efforts to remove them by manipulation, even in the presence of infection of a rather virulent type,

and especially if we succeed in getting the catheter by the stone for drainage and pelvic lavage.

Dr. FRANK S. PATCH (Montreal, Canada): My first ureteral reflux occurred in a woman whose kidney had been removed for tuberculosis. Three weeks after the nephrectomy, about the time that absorption of the twenty day catgut, used in tying the ureteral stump, might be expected to take place, the wound was flooded by the bladder contents. The affected ureter in this case was a rigidly dilated one. While my own series of ureteral refluxes is modest in comparison with that of Dr. Bumpus, reflux has been noted in much the same types of cases. My interest has been aroused particularly by the reflux which occurs with chronic obstruction of the lower urinary tract in infants and children. In some of these cases, infection has been marked, probably as a result of the obstruction. In others, where obstruction had not produced sufficient dilatation above the point of obstruction, the infection was not so marked.

I desire to stress the mechanical rôle played by an obstruction in the lower urinary tract in producing ureteral reflux. In such cases, the infection is secondary. When established, the two conditions act in a vicious circle.

Ureteral reflux occurs more frequently than is generally believed and the cystogram deserves a place in our routine urological procedures.

Dr. H. C. BUMPUS (closing): Answering Dr. Barringer. The investigation showed that renal function is not interfered with as a result of reflux but that when renal function is diminished in the presence of reflux it results from the same cause that produced the reflux.

In undertaking this work originally we hoped to demonstrate clearly that reflux occurred in cases with obscure nerve lesions of the urinary tract, producing atony. It became evident as the work progressed that it was impossible from a clinical standpoint to prove this fact because in every case you found the presence of infection playing the major rôle.

Dr. Kretschmer's work in showing the reflux in normal cases was done with children, possibly in infants the nervous system is not developed as highly as in adults and reflux ceases to occur with development of the nervous system. Whether reflux ever occurs in the absence of infection as a result of nerve injury I do not think can be ascertained except experimentally in animals.

I am very glad to hear so many of the members citing cases of reflux on the sound side in renal tuberculosis. I looked the literature over but could not find this point referred to anywhere, although we have seen it quite often, and I felt that was one of the important findings explaining how one may obtain the tuberculosis bacilli from the sound kidney.

Important from the clinical side is the dilatation of the ureters in chronic pyelonephritis. If that portion of the ureter passing through the bladder wall has not become dilated as a result of the infection in proportion to the dilatation occurring in the upper portion it will act as astrictureand result in faulty drainage. Therefore, complete dilatation of the lower portion of the ureter I believe is essential to successful treatment of pyelonephritis.

A NEW METHOD FOR GRADUAL DECOMPRESSION OF THE BLADDER IN CASES OF MASSIVE RETENTION

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It has long been realized that the complete removal of a massive bladder retention by catheterization may be followed by bleeding from the bladder and kidneys, the appearance of increased albumen and casts in the urine, rapid diminution of renal activity, and the occurrence of circulatory embarrassment, which may result in the clinical picture of uremia and sometimes proves fatal. This clinical phenomenon led, many years ago, to the practice of gradual emptying of the over-distended bladder, either by frequent catheterization or employing an indwelling catheter and decreasing the bladder content at regular intervals, as experience proved that gradual, rather than sudden, reduction of the bladder over-distention lessens the occurrence of renal and circulatory embarrassment. It remained, however, for modern methods of study of renal activity, of the circulation and of blood chemistry, to furnish the explanation of the phenomenon of occasional renal and circulatory collapse, resulting from the sudden complete emptying of a chronically over-distended bladder.

It is now known that when the over-distended bladder is emptied at one sitting, there not only results a sudden drop of intravesical tension, but also of intrarenal tension as well, with resulting renal edema, passive congestion, and occasional hemorrhage, which produces a varying degree of renal inactivity, even to the extent of complete urinary suppression in some instances.

Such a passive congestion invites renal infection, if not present, and renal infection already existing is given impetus for activity, thus further lessening the ability of the kidneys to function.

Reflection of this renal condition on the circulation, as pointed out by O'Conor (1) and since substantiated by many observers, shows that soon after the emptying of the chronically over-distended bladder there results a rapid fall of the systolic blood pressure, so that the kidneys, already impaired in their secretory power by passive congestion and possibly by infection, are further hindered in their ability to secrete by the lessening of arterial tension. In consequence of the renal impairment from these sources effete products are retained in the blood, as shown by blood chemistry studies, and the state commonly recognized as uremia may result.

During the period of the development of the method of preparing prostatic patients for operation, roughly for the past fifteen years, and the appreciation of the necessity for constant bladder drainage as a fundamental preliminary measure, the old teaching of gradually emptying the over-distended bladder has been largely neglected, with the result that most of us can recall patients who have died of uremia, probably from this neglect. Since the work of O'Conor, Van Zwolinburg, and Bumpus and Foulds, there has been a realization among urologists of this rather general neglect of the old teaching in regard to gradual rather than sudden emptying of the over-distended bladder, and new methods to accomplish this have been devised and used with benefit.

The fact that the majority of the patients observed by O'Conor and others reach the lowest point of drop in blood pressure between the second and fourth days (usually forty-eight hours), as a result of complete emptying of the over-distended bladder, and that during this period there is greatly diminished renal secretion and increased nitrogen retention in the blood; it is obvious that a sudden emptying of a massive bladder retention should be avoided, and a gradual decompression of the bladder over-distention, without reducing intrarenal and circulatory pressure suddenly, should be practised, so that the kidneys and the

circulation may be gradually adjusted to the lessening of intravesical and intrarenal tension.

In 1920 Van Zwolinburg (2) described an apparatus by which intravesical pressure could be gradually reduced. This apparatus consisted of a reservoir attached to the patient's bed. into which a rubber tube led from an indwelling catheter. By elevating and lowering the reservoir intravesical pressure could be influenced and by gradually lowering the level of the reservoir, the intravesical pressure is gradually reduced. This device, with slight modifications, particularly the introduction of a manometer scale, so making possible the readings of intravesical pressure, has been employed at the Mayo Clinic, and Bumpus and Foulds (3) have reported on the results obtained in 83 patients. Eleven of these patients were in poor general condition and most definitely uremic, and the employment of this device showed most convincingly the value of gradual decompression of the chronically over-distended bladder in bringing about satisfactory renal and circulatory adjustment. As a result of employing the modified Van Zwolinburg apparatus, none of the patients died of uremia, and it was possible to carry out operative methods to relieve the obstruction either by radical or palliative measures. These authors express the belief that the use of this device was an important factor in bringing about a satisfactory renal and circulatory adjustment.

They show that before any attempt was undertaken for relief of the massive retention there was a high blood urea and nitrogen retention, associated with high systolic blood pressure and that after producing bladder drainage, with the Van Zwolinburg apparatus, gradually reducing the intravesical pressure over a period of several days, the renal function tests and the fall in systolic blood pressure was less marked, and a gradual reduction of retained blood urea and nitrogen took place. In other words they prevented the renal and circulatory collapse which may result from emptying the bladder suddenly.

Shaw and Young (4) in a study of 25 cases with over-distended bladders which were gradually decompressed, agree with the general facts in regard to the advantages of gradual decompres-

sion rather than sudden emptying of the bladder, and state that their patients with massive retention due to prostatic obstruction were brought to a satisfactory state for operation in about half

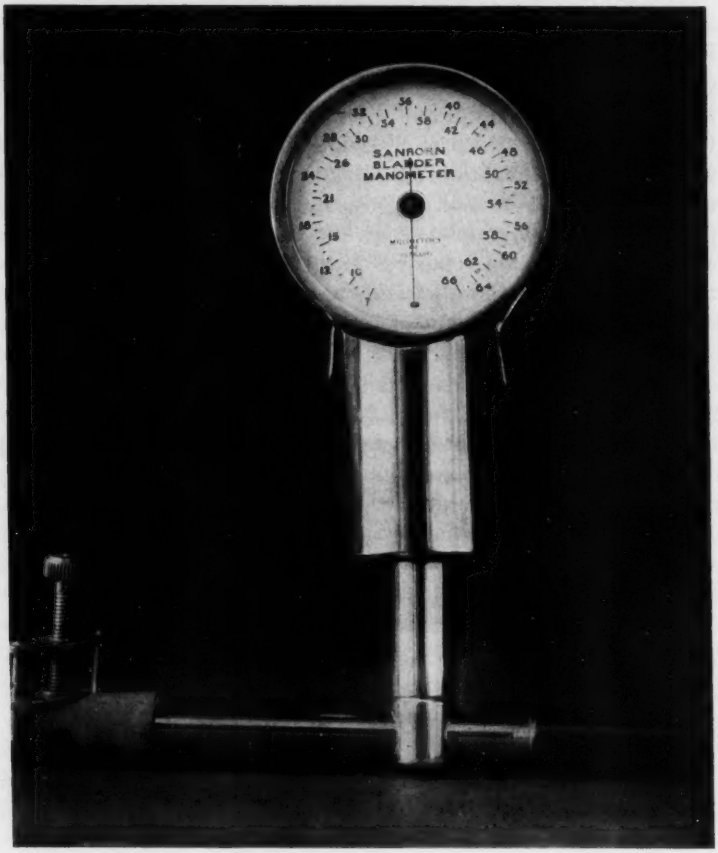

FIG. 1

the time required by free drainage. They attribute this to the fact that continuous free bladder drainage, without any attempt at gradual decompression, may be followed by a more or less

severe reaction, as evidenced by renal, circulatory, and nervous symptoms, the most frequent of which are referable to the urinary system, they having observed bleeding from the bladder and kidneys, albumen and casts in the urine, and an abrupt drop in renal function, and rise in blood nitrogen retention. They have noted these signs in some cases without a fall in the systolic blood pressure, although they more commonly observe the blood pressure to fall as pointed out by O'Conor. They believe that the nervous symptoms, memory disturbances, flightly speech, and the psychosis so commonly observed in prostatic patients with impaired renal condition, while occurring in patients who showed fair blood chemistry, do not occur so commonly when bladder distention is subjected to gradual decompression.

Venturi Tube

FIG. 2

From all the evidence at hand there appears to be no question that gradual decompression of a massive bladder retention, either by an indwelling catheter through the urethra when possible, or by a suprapubic cystostomy when necessary, is the procedure which brings about the most satisfactory adjustment in the urinary and circulatory system. The only question remains as to how this may be best accomplished. For the past year we have employed a device which we believe to be simpler in every way than the apparatus of Van Zowlinburg and that described by Shaw and Young (4).

This device, which we term a bladder manometer, was made through the coöperation of Mr. Sanborn of the Sanborn Diagnostic Apparatus Company, and consists of a measuring tube and indicating gauge (fig. 1). The tube is designed on the principle of the Venturi Meter, which is used for the accurate measurement of the flow of gases and liquids. The Venturi principle is to reduce the diameter of a tube or pipe and cause an increased velocity (fig. 2). The pressure head which is exerted against the walls of the reduced section is also greater than it would be in a larger section. This affords a greater range for measurement of pressure heads for a given flow. In other words, by means of this constriction, the difference between static pressure and velocity pressure is reduced to a minimum.

The form of pressure gauge that is used is similar to the ordinary blood pressure gauge, the principal difference being that the diaphragms of the gauge have been increased in number and a special movement and graduations for the dial have been provided.

The combined Venturi tube and gauge, which constitutes the Bladder Manometer, gives more magnified readings than could be obtained with a straight tube and an ordinary gauge.

The method of employment is simple. After establishing constant bladder drainage, either by an indwelling catheter or suprapubic cystostomy, the manometer is attached to the catheter with as little loss of urine as possible. The gauze is fixed on the inner aspect of the patient's thigh by adhesive (fig. 3), and the outlet tube allowed to drain over the side of the bed into a receptacle. The flow is regulated by the adjustment clamp on the distal tube. The initial pressure readings having been recorded, the clamp is loosened sufficiently to permit a constant flow, at a given reduced pressure. At intervals of twelve to twenty-four hours further reductions are made, so that finally the intravesical tension is reduced to zero, and the bladder completely emptied.

The criterion for discontinuing gradual decompression in our opinion lies in the degree of renal and circulatory adjustment. It is our rule to continue until the systolic blood pressure begins

FIG. 3

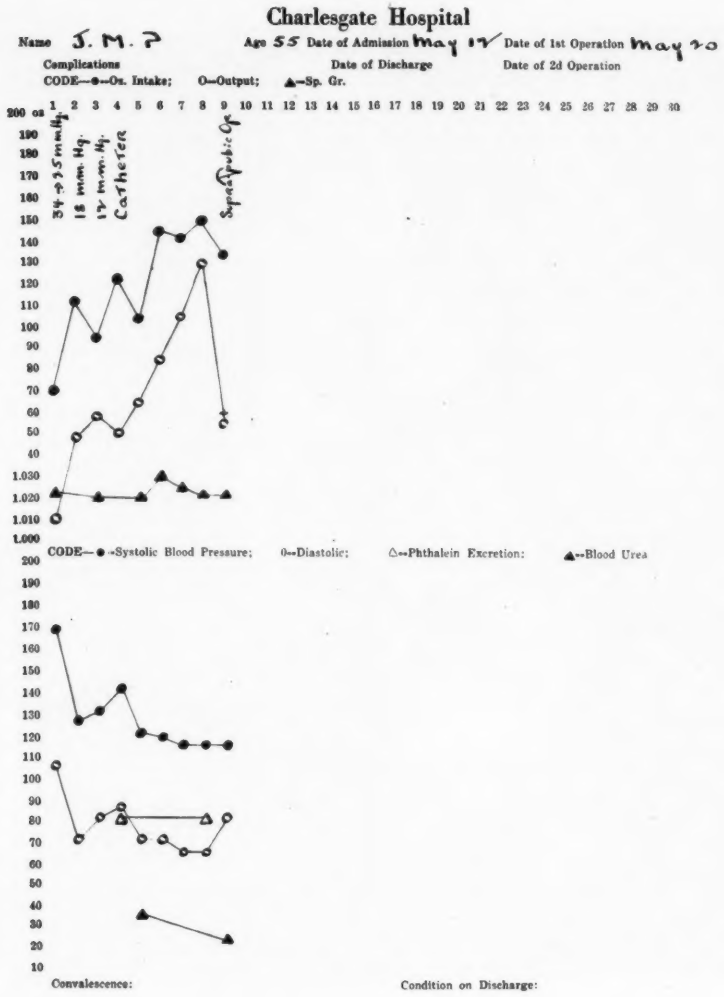
Charlesgate Hospital
Name J. M. P
Age 55 Date of Admission May 17 Date of 1st Operation May 20
Complications
Date of Discharge
Date of 2d Operation
CODE—●—Os. Intake; O—Output; ▲—Sp. Gr.
200 oz
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
1.030
1.020
1.010
1.000
34 + 35 mm. Hg.
18 mm. Hg.
12 mm. Hg.
Catheter
Sp. Gr. 1.030
CODE—●—Systolic Blood Pressure; O—Diastolic; △—Phthalein Excretion; ▲—Blood Urea
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
Convalescence:
Condition on Discharge:

FIG. 4

to rise again after the initial drop, and improvement is evident in the blood chemistry. This will usually require three to four days.

Estimation of phthalein output which some authors have shown to gradually rise with the gradual fall of bladder pressure, we have found necessary to postpone, for the reason that accurate measurement of the dye can hardly be made until the bladder is emptied. Figure 4 is given as an illustrative chart. This patient was admitted to the hospital after thirty hours of complete urinary retention, due to benign prostatic obstruction. On examination he was found to be in extreme distress; the pulse was rapid and very thready; and the bladder was distended to a level well above the umbilicus. A no. 16 coudé catheter was passed, and to this the bladder manometer was attached. Intravesical pressure was 34 mm. of mercury.

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SEMINAL VESICULITIS AS A COMPLICATION OF PROSTATISM AND PROSTATECTOMY

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This brief paper is based on only a few ideas and even fewer established facts, but is presented in the hope that it may stimulate further interest and investigation which I am reasonably sure will be productive.

When one considers the relation of the ejaculatory ducts to the prostatic urethra, the distrubed mechanism of urination which exists throughout the course of cases of prostatism beginning with the earliest symptoms and lasting throughout; if one considers too that in a large majority of these cases the urine is grossly infected and that at the operation of prostatectomy the ducts are frequently traumatized, sometimes even cut or torn across, it would seem that the stage were set for infection of the seminal vesicles directly along the caliber of the ejaculatory duct or through its own or adjacent lymphatics. I believe it is reasonable to assume that infection of these structures may occur, and in my opinion it does occur with a fair degree of frequency. Yet up to the present time this subject appears to have attracted very little attention from the profession. A careful survey of the literature was entirely barren with the single exception of a paper by Boyd (1) of Georgia in which he reports a case of seminal vesiculitis following prostatectomy, the micrococcus catarrhalis being the organism involved, and an excellent paper by the same author (2). This paper came to my attention when my own paper was about completed, so that evidently we had been working independently along the same line. Nevertheless I feel that Dr. Boyd is entitled to all the credit for bringing this important matter to the attention of the profession. In his paper he points out the close relationship between epididy-

mitis and vesculitis, maintaining that epididymitis always means also a vesiculitis on the corresponding side. He feels that an acute vesiculitis occurring shortly after a prostatectomy accounts for certain local and systemic distrubances which have hitherto been attributed to other causes. He maintains that the cause of this complication lies in trauma inflicted upon the vesicles and ampulla at the time of operation, plus inadequate drainage of the prostatic bed. He makes practical applications of this concept of the etiology and tries to prevent it by employing gentle manipulation on enucleating the prostate and by carefully providing for drainage of the prostatic bed as a part of his operation.

I agree with him that epididymitis practically always means an associated vesiculitis. I feel however that vesiculitis occasionally occurs independent of any involvement of the epididymus. My own paper concerns itself more particularly with clinical phases noted in the later stages following prostatectomy and cases of vesiculitis complicating prostatism which have not been subjected to operation.

My attention was first called to this matter about two years ago by a few cases occurring in my clinic. The patients following prostatectomy reported at the out-patient department for observation and such treatment as might be indicated. In some ways these cases might be classed as good results. They looked better and felt better, the urine was less cloudy, and the amount of residual was reduced to a very small quantity or nothing at all. And yet one symptom, frequency of urination, persisted almost if not quite as severly as before operation. Many times this was the symptom which brought the patient to the clinic, so that if we were satisfied with a successful operation he was not satisfied with the result obtained. We attributed this state of affairs to the complicating cystitis and accordingly put them on bladder irrigations, using various solutions, internal urinary antiseptics, santal oil, etc., with very little if any improvement. A few of these patients volunteered the information not in the nature of a complaint but rather as a statement of fact, perhaps as an accomplishment, that they were having

frequent erections which they had not had for years before. Upon inquiry into this symptom it was developed that the erections were not accompanied by any sexual desire, and were sometimes actually painful. Even with this suggestive symptom to guide us we still failed to grasp its significance, and persisted in our bladder lavage with scant results. It was not until several months later that it occurred to us that the seminal vesicles might be at fault and that a careful rectal examination was indicated. Right here I should like to interpolate that in my opinion this item is often neglected in the after-care and treatment of patients who have been subjected to prostatectomy. I am sure that I had neglected it before my attention was drawn to the subject under consideration. Since that time I have made it a part of a routine procedure, and consider it very important.

In all of the cases referred to above rectal palpation disclosed unmistakable evidences of vesiculitis or perivesiculitis. In some instances the vesicle could be distinctly felt, thickened, hard, and somewhat tender. In other cases a plastic exudate was noted about one or both vesicles, extending higher than the finger could reach. All of these cases were improved by massage, some of them so promptly as to be very striking. In 50 per cent of these cases it was impossible to obtain any material for smears and cultures. I assume that in these cases the contents of the vesicles were squeezed directly into the bladder. In those cases in which we were able to obtain smears we invariably found pus, varying from few clumps to smears which had the appearance in gross and under the microscope of pure pus. For some reason or other, faulty technique perhaps, our cultures were unsatisfactory, either being sterile or presenting evidence of contamination. This item I believe is well worthy of further investigation.

The symptoms which have focused our attention in all of these cases has been the marked frequency of urination both diurnal and nocturnal, persisting after operation, and the tendency to mild priapism. Having satisfied ourselves that this condition occasionally occurs as a complication of the prostatic problem and that in some of our cases it no doubt existed before operation,

we made it a point to keep it in mind when examining cases which were referred as possible candidates for prostatectomy, and found as noted below, a few cases which seemed to fit in with our conception of such a combination of pathology. We were led to suspect such a state of affairs in all cases when the urinary frequency was out of all proportion to the degree of mechanical obstruction as evidenced by the amount of residual urine. We felt fairly well confirmed in our suspicion if there was added to this a tendency to priapism.

This paper is based upon a series of 10 cases studied following a prostatectomy, and 4 cases observed in which no operation has been done. Of the 10 operated cases, in 1 which will be reported in detail at the end of this paper I am sure the condition existed before operation. In fact I doubt if the operation (prostatectomy) was well advised. In 2 others a careful review of their history leads me to believe that vesiculitis was a prominent factor in producing the symptoms before operation. In the remaining 7 it would appear that the condition occurred as a complication of the prostatectomy rather than the prostatism. In 3 of these cases there was a history of a rather severe epididymitis complicating the convalescence while the patients were still in the hospital. One of these occurred in a patient whom we assume had his vesiculitis before operation. The other 2 were in cases where we believe the vesiculitis followed the prostatectomy. In still 2 other cases small hard nodules were noted in the epididymis which had not been noted in the previous record, nor was there any record of acute epididymitis while in the hospital. It is quite possible, rather likely I think, that this may have occurred and passed without note. It would seem reasonable to assume that epdidymitis would occur rather commonly in connection with vesiculitis, but we have not yet studied a sufficient number of cases to establish the connection.

In all the cases studied the urine was grossly infected before the operation. In 5 of these colon bacilli were found on culture, in the remaining 5 there was no note of the organism. In 3 cases the urine promptly cleared as soon as treatment was directed

to the vesicles; in 2 others it became clear after a rather prolonged course of massage and bladder lavage; in the remaining 5, while the subjective symptoms were markedly improved the urine remained cloudy when last observed.

The 4 unoperated cases were all seen in private practice and were all referred to us for prostatectomy. They all had slightly turbid urine, they all had some prostatic enlargement, and they all had residual urine ranging from 1½ to 3 ounces. In 3 of these cases one could note in addition to a slight enlargement of the prostate, definite evidences of a vesiculitis on one or both sides. In the other case, the first impression that one got with the examining finger was that of a prostate rather markedly enlarged. More careful examination revealed what I interpreted as a pair of large flabby vesicles prolapsed over a boggy prostate. One of these patients was entirely relieved of all symptoms, including his residual urine, after three months of massage. He now reports at occasional intervals for a check-up, so that we know that so far his relief has been lasting. One case passed from observation shortly after beginning treatment, 1 case was much improved when last seen, and 1 is still under treatment, and is improving.

It is my custom to treat these cases twice a week as follows: The patient first voids; the urethra is then irrigated with a 1:4000 acriflavine solution; the bladder is then filled through a small catheter with the same solution; the vesicles are now massaged and the patient voids again. While this is perfectly simple of course I believe that attention to each detail is important.

The following case is reported in some detail since it illustrates perhaps better than a long paper would do, the points which I have attempted to make.

Case report. J. H. O., aged sixty-three, married. Applied for treatment April 21, 1921.

Family and general history. Irrelevant. He denies any venereal history; has been married twenty-eight years and has had a reasonable normal sex life. For the past eight years he has been troubled with frequency and urgency which have been gradually getting worse, until now he urinates every one and one-half to two hours by day and

four or five times at night. For the past year has had frequent erections not accompanied by any sex desire. He has had an erection each time he is awakened at night to urinate; the erections are not painful but annoying.

Examination. He has the appearance of being in good general health. General physical examination negative. The external genitals are normal. The urine is passed in rather a slow feeble stream. Residual urine—2 ounces; rather hazy; contains a moderate number of pus cells, and culture shows B. coli.

Rectal examination: There is a moderately well marked, general, regular, prostatic enlargement. No note was made in reference to the vesicles.

Cystoscopy: The deep urethra is very sensitive; there is a well marked congestion of the trigone and deep urethra, and moderate enlargement of both lateral lobes of the prostate.

Operation was advised. He was admitted to the Brooklyn Hospital on June 3, 1921.

'Phthalein: June 4: first hour, 15 per cent; second hour, 15 per cent; third hour, 5 per cent.

Wassermann negative.

Blood chemistry: Uric acid, 4.2. Urea, 38.95. Creatinin, 2.17. Sugar, 109. CO_2 combining power, 62.4. Chlorides, 490.

June 7, 1921. Cystotomy under local anesthesia. It was noted at this time that there was no thickening of the bladder wall. This is an important item to which sufficient importance was not attached at the time. A marked degree of mechanical obstruction extending over a period of eight years would certainly have induced some degree of hypertrophy in the bladder musculature. The moderate enlargement of the prostate as noted at cystoscopy was confirmed.

June 19. 'Phthalein, 30, 15, 10.

June 20, 1921. Suprapubic prostatectomy under nitrous oxide. The gland was enucleated in two pieces with some difficulty. The pathological report was as follows: The stroma is open and edematous and contains numerous areas of lymphocytic infiltration. The alveoli are for the most part dilated. The epithelium is flattened and numerous large corpora amylacea are present. A few of the alveoli contain numerous polymorphonuclear leucocytes. Obviously there is a predominating element of inflammatory reaction.

Except for an abdominal wall infection from which B. coli were recovered his convalescence was uneventful and he was discharged

from the hospital on July 8, 1921. At this time he was voiding rather cloudy urine at rather frequent intervals. He went to the country and was not seen again until November, 1921, at which time he reported that he was urinating every two hours by day and getting up three or four times at night. His troublesome erections were just as as bad as ever. The urine was variable; it was occasionally crystal clear, at other times it was cloudy and contained abundant pus cells. The appearance of the urine seemed to have no bearing on the subjective symptoms.

He was not seen again until April, 1922, and had bladder washings until the end of the year at infrequent intervals, with no improvement.

After several months' absence he reported in April, 1923. His condition had remained about the same until the last four weeks, during which time he had been worse. In fact his symptoms were more aggravated than they were before operation. Rectal examination at this time disclosed a well marked exudate around both vesicles, somewhat tender and extending as high as the finger could reach. Gentle massage on this area expressed what appeared in gross and under the microscope as pure pus. Cultures were sterile. A few days later he developed a very sharp right epididymit is. Massage was resumed on May 1 and continued at three or four day intervals over a period of three months with rapid and marked improvement in all symptoms.

July 9, 1923. Feels much better. Gets up once at night. Urine clear.

September 13, 1923. Entirely free from all symptoms. Urine and vesicular smear free from pus.

Comment. While this man had a moderate prostatic enlargement it was not grossly obstructive, and his symptoms were doubtless due almost entirely to the complicating vesiculitis. If this fact had been properly appreciated he could have been restored to health by simple, conservative measures, and have been spared an operation which, to say the least, was of doubtful value.

In conclusion I realize that this paper has been very sketchy, that the amount of material studied is hardly enough to warrant drawing any definite conclusions; that the degree of intensiveness with which these cases have been studied and the brief

method in which they are now presented are not specially convincing. However the subject is presented as I said at the outset for your consideration and discussion in the hope that it may stimulate further investigation and study. I am confident that this complication occasionally occurs, that it is the cause of very annoying symptoms which persist if the real pathology is overlooked and are readily and promptly relieved by very simple measures when properly understood. I believe too that a proper appreciation of this lesion as a possible factor in the problem of prostatism may save an occasional case from the danger and discomfort of a major operation.

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SPONTANEOUS HEMORRHAGE FROM THE URINARY BLADDER OF UNKNOWN ETIOLOGY

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A recent experience with a patient with spontaneous hemorrhage from the urinary bladder of unknown etiology together with infrequent reports of similar cases in the literature makes this subject in my opinion interesting and new, so that I present for your consideration a short résumé of the literature and a case report.

ETIOLOGY

Vesical hematuria may be produced by general or local causes. The general causes are purpura, hemophilia, lues, scurvy, rheumatism; fevers as malaria, typhoid and scarlet; drugs and chemicals, such as fuchsin, turpentine, phosphorus, cantharides, urotropin, etc. The local causes are infections, new growths, trauma, circulatory disturbances and vicarious menstruation.

Purpura as a cause of vesical hematuria has been described by Stevens and Peters, Kretschmer, Kidd and others. Stevens and Peters examined 25 patients with urinary tract purpura. This study reveals no predisposing causes for the condition. The urine contained gross blood. Cystoscopy revealed fresh multiple hemorrhages in the bladder wall, unassociated with inflammation or other cause. From both ureteral orifices there was bloody urine. Pathological specimens were sectioned from selected hemorrhagic areas. The pathological findings, while not characteristic, revealed hemorrhages into the tissue, but no inflammation, occasional thrombi and engorgement of the vessels. If the condition was long standing, degenerative changes were found in the connective tissue of the submucosa.

Kretschmer's article is very complete. This writer analyzes all the cases reported up to the time his paper was published.

Kidd was able to cystoscope his patient several times during the course of the disease, so that he observed the purpuric spots disappear during his treatment. The patient became well and free from further hematuria. Kidd finds that an appearance may be met with in the mucous membrane of the bladder exactly resembling a purpuric eruption on the skin which clears up like a simple purpura and which may be unaccompanied by other signs of hemorrhage, either into the skin or into any other mucous membrane or part of the body.

The cystoscopic picture, as described by one writer, resembles flea bites without local infiltration. The affected areas are hemorrhagic. The adjacent tissue and the rest of the bladder mucosa is normal. Hemorrhagic spots without local infiltration and without a break in the mucosa are differential diagnostic findings with the cystoscope. In chronic purpura of long standing, the mucosa may be broken. In some instances, as mentioned below, the hemorrhagic spots may develop into an ulcer. The usual disappearance of the spots very quickly after treatment is begun, differentiates this condition from tuberculosis and other bladder infections.

Dr. V. Blum writes concerning purpura vesicae and ulcus simplex vesicae pepticum. He summarizes as follows:

> The acute hemorrhagic cystitis characterized by small or large hemorrhages into the mucous membrane of the bladder is similar to purpura hemorrhagica and rheumatica, a consequence of a general infection or intoxication. This occurs in certain seasons of the year and should be called purpura vesicae.

Such hemorrhages may be resolved, but frequently change into a hemorrhagic erosion later to a superficial or deep ulcer which may later perforate the bladder. A vein or a small artery may be caught in such an ulcer and serious hemorrhage result. Most spontaneous ulcerations of the bladder are secondary to and caused by hemorrhagic lesions. The peptic qualities of the urine may cause an intramural or submucous hemorrhage to become an

ulcer simplex. Dr. Blum finds an analogy in the symptomotology, the course, the activity and the pathogenesis between this ulcer of the bladder and those of the stomach. Permanent alkalization of the urine is the treatment of choice wherever purpura vesicae is found. Dr. Blum finds that trauma, infections, intoxications, emboli and thrombi of the vessels of the mucosa and the peptic quality of the urine as causes of this type of ulcer of the bladder.

Condit in 1916 reported a patient with compensatory or vicarious menstruation. In this article, the literature is carefully reviewed wherein reports of bladder hemorrhage due to vicarious menstruation are mentioned. The previous history is usually suggestive of this condition unless the patient is having her first attack. The histories of 3 males who had bloody urine accompanied by all the symptoms of menstrual flow are given.

Barney's recent article concerning hemophilia as a cause of hematuria, indicates that this condition has to be thought of when considering causes of bladder hemorrhage. No report is found of hemophilia producing bladder hemorrhage alone.

Lues may produce lesions in the bladder simulating all other lesions occurring in this organ. Hematuria may be present, but it is infrequent that severe hemorrhage is produced. I could find no reference in the literature to a published report of this condition.

Other conditions mentioned above as general causes of bladder hemorrhage will have other symptoms or findings which quickly direct the physician's attention to a correct diagnosis. In most of these the hematuria is usually from the kidney as well as from the bladder, except with purpura, wherein the hemorrhagic spots may be in the bladder only.

Among the *local causes*, infections account for a large number of hematurias of bladder origin. They infrequently produce a severe hemorrhage. As mentioned above, localized areas of cystitis in which vascular changes have taken place so that a chronic condition is present may produce hemorrhage into the bladder. Frequently such lesions may become ulcers. Symptoms other than hematuria such as frequency, difficulty and burning at

urination attracts the surgeon's attention to the urinary tract, so that the cause of the hematuria is quickly determined. In some instances, however, a chronic localized cystitis may have hematuria as a prominent symptom. In rare instances severe hemorrhage may occur into the bladder from such lesions. Dr. E. Klausner of Prague recently reported his experience with yeast infection as a cause of hemorrhage from the bladder. This infection is usually a contamination from instruments. The prostate and seminal vesicles may be involved.

New growths as a cause of hematuria or hemorrhage into the bladder are understood by all urologists. A beginning papilloma that through the cystoscope looks like a feather and that transmits light, may cause serious bleeding. These may be very small and very thin so that they are sometimes not seen with the cystoscope. When a suprapubic exploration of the bladder is made, a small papilloma may be accidentally brushed off when removing blood clots. Some of the reports in the literature indicate that a small papilloma was suspected as the cause of severe hemorrhage into the bladder. In these instances exploration of the mucosa of the bladder after removing blood clots was negative. I reported in the Urologic and Cutaneous Review in March, 1922 (vol. xxvl, No. 3, p. 135–136), a secondary hemorrhage, following operation for removal of a bladder tumor. This was caused by a small feather-like papilloma of the posterior urethra. This tumor was not seen during two cystoscopie s and it would never have been found if severe bleeding had not occurred.

Trauma as a cause of vesical bleeding is usually accompanied by a complete history. However, a slight trauma may cause hemorrhage because of rupture of a vein or an artery, in a chronically distended bladder or one with varices from extravesical tumor. In one or two experiences that I had, the bleeding did not follow immediately after the trauma.

Circulatory disturbances are rarely mentioned in the literature as a cause of vesical hemorrhage. Dr. Julius Vogel in the Berliner Klinischer Wochenschrift, 1910, writes that alterations of the blood vessels present the rarest cause for bladder bleeding. In necropsy protocols blood vessel pathology of the blad-

der is rarely mentioned. These pathological changes in the dead body are very inconspicuous as the veins of the mucous membrane of the bladder have a very fine calibre, so that after death an important dilatation may be overlooked. Bladder varices are secondary to circulatory disturbances in the bladder from pressure of tumors or organs outside the bladder. They may bleed at certain times only and thus simulate bladder tumor. Many observers have reported bleeding from a point where small veins cross. The smallest unnoticed blood vessel alteration may occasion the most severe bladder hemorrhage.

CASE REPORTS

A careful complete study of this patient was impossible before operation. The patient was under the care of her home physician for several days before being referred to me for study, during which time there was severe hematuria. She came into the hospital very ill and with severe pain. Our examination, which had to be hurried, revealed the following: A married woman of forty-four years of age, with extreme pain over the lower abdomen, a much dilated bladder and excessive pallor. She had a pulse of 100, of fair quality and no temperature. Cystoscopy was attempted at once, but as only a few of the clots from the bladder could be removed, this was unsatisfactory. A large catheter was inserted through the urethra and everything that might dissolve blood clot was used without success. The following day a second attempt at cystoscopy was made with the direct vision cystoscope and many clots were removed. The ureters were finally observed, but it was impossible to completely empty the bladder. A roentgenogram of the kidneys, ureters and bladder was negative. The hemoglobin was 50 per cent; red cells were 3,800,000; leucocytes 12,900. The relaxation of pressure in the bladder caused by the removal of a great many clots during cystoscopy, caused the bleeding to start again. Twelve hours following the second cystoscopy, the hemoglobin had dropped to 39 per cent. At this time the bleeding time was three and one-half minutes and the coagulation time five and one-half minutes.

Because the patient was wholly unable to urinate, except for an occasional blood clot, which was forced out with the greatest effort and pain, a suprapubic cystotomy was done. With a large tablespoon as a scoop, a very large panful of clots was removed. When the bladder was completely free from clots, no bleeding area could be found. There

was no evidence of papilloma or other tumor and the ureteral orifices seemed to be exuding clear urine. Soft ureteral catheters were passed through the ureters and into both kidney pelves. The character of the urine from each kidney was determined. No hemorrhage was caused by the passage of the ureteral catheters. Additional self-retaining retractors were put into the bladder and were widely opened. As the folds of the trigone were spread apart, a spurting of blood could be seen coming from a point slightly internal and about ½ inch posterior to the left ureteral orifice. The bleeding was not stopped with hemostats so that the area was carefully stitched with fine gut until the field was dry. This area was carefully palpated for evidence of tumor or other pathology. The mucosa of the bladder did not seem to be broken, there was no redness, erosion or other lesions that the naked eye could detect. There were no prominent blood-vessels observed.

With the bladder open, a bimanual examination of its base was made. No unusual thickening or hardness or any other condition could be felt. Before the bladder was closed, the area which had been bleeding was carefully examined and was several times brushed with a sponge to promote additional bleeding. The hemastasis was good. The patient was given a transfusion of citrated blood and returned to bed. She was carefully stimulated by heat, etc., and was quieted with morphine.

For ten days there was no bleeding and the patient seemed to be recovering very rapidly. On the eleventh day oozing began from the urethra. This became very marked and continuous. A large endoscope was passed, but no evidence of papilloma or other lesion could be found in the urethra. The urethra was packed with narrow gauze through the endoscope. The bleeding continued for several days and as we seemed to be losing the ground which we had gained during the ten days following the first operation, the bladder was reopened. Absolutely no bleeding area could be found. It is possible that the patient had bled so much that her blood pressure was not sufficient to produce bleeding at this time. The bladder was carefully but not tightly packed with gauze. The patient was transfused and was given a quantity of normal saline to increase blood volume before her return to bed. On this day the hemoglobin had dropped to 31 per cent.

The patient's condition did not improve. Oozing of bright red blood was noticed continuously on the urethral dressing. The packing was replaced when necessary. Other methods of controlling hemorrhage were used. The bleeding continued until the patient died, the twentieth day following her first operation.

Before death, she became very weak with a small, rapid pulse. Respirations were labored and rapid with evidence of pneumonia.

A complete autopsy was made, when particular attention was paid to the urinary tract. The pathologic anatomic diagnoses submitted by the pathologist are as follows:

1. Bilateral pyelonephritis
2. Ureteral dilatation
3. Thickening and inflammation of the right ureter
4. Gangrenous inflammation of the bladder
5. Bronchopneumonia
6. Recent operative wound

The gangrenous inflammation of the bladder was probably caused by numerous stitches which were used to stop the bleeding at the first operation and the packing which was done at the second operation and which was allowed to remain in place for several days. No cystitis was found when the patient was examined at the first operation.

There was absolutely nothing in the previous history of this case which assists in accounting for the cause of bleeding. There was no history of lues. The patient had had 7 pregnancies—all children were apparently born healthy, although 4 of these had died in infancy. Wassermann test was not made by me, although the family physician, who has frequently seen this patient, is sure that at some time he did make a Wassermann test for some other reason and found it negative.

The only incident which might have had a bearing on the etiology of this condition is that the patient fell from a ladder about ten days preceding the onset of the present trouble, at which time she struck her back and left side. The fall stunned her slightly, but she was not severely hurt.

The hematuria which was the first symptom of this patient's last illness was accompanied by severe pain over the lower abdomen. The patient did not say that the pain was associated with difficulty or inability to urinate, although from the findings, I am under the impression that the hematuria began silently and that the pain was caused by the distention of the bladder, caused by an accumulation of blood clots.

A varicosity or other blood vessel anomaly, which may have been present before her fall, may have been injured. This trauma was not sufficient to rupture the vessel at the time it occurred. Sudden increase in pressure produced by cough or straining at stool may have been sufficient to rupture this small artery at the time the hematuria and pain were first noticed.

A report of a single case is not sufficient evidence from which conclusions may be drawn. However, the rarity of this condition, together with my inability to control the hemorrhage, prompts me to suggest the following:

1. Hemorrhage may occur into the urinary bladder spontaneously.

2. The important general and local causes are purpura, lues, drugs and chemicals, trauma, infectious new growths and circulatory disturbances.

3. Circulatory disturbances together with slight trauma may cause the rupture of a small artery or vein which condition may not be found at operation or at post-mortem.

4. A small new growth which may produce a severe hemorrhage into the urinary bladder may not be seen through the cystoscope or when the bladder is opened surgically.

5. Purpura produces hemorrhage into the urinary bladder. The bladder lesions may be the only ones demonstrable as other parts of the body may be free from hemorrhagic spots.

6. Spontaneous hemorrhage may occur into the urinary bladder without previous history or findings at operation or post-mortem which indicate a possible etiology.

7. Spontaneous hemorrhage into the urinary bladder of unknown etiology may be uncontrollable and may cause death.

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CHRONIC URETHRITIS IN WOMEN: A FREQUENTLY OVERLOOKED CONDITION

JAMES PEDERSEN

New York

The title was suggested by two recent, able papers, both of which were designed to survey urology as applied to women, but in neither of which was chronic urethritis as such, nor its treatment, given more than a negative reference.

Some years ago, Bugbee, in a thoroughly comprehensive paper, analyzed 1000 cases of "frequency of urination in women," and demonstrated, among several conclusions, that many women, from about the second decade on, suffer from frequency of urination, due to simple chronic urethritis alone, though admittedly it is often associated with some degree of trigonitis, and sometimes with urethral stricture, also.

Clinically the fact remains that many women with chronic urethritis, go on suffering the inconvenience and even decided pain of frequent urination, unrelieved by the family physician's medication and his irrigation of the bladder, who could have been spared much through the correct diagnosis of this easily accessible condition. Furthermore, not a few women go through cystoscopy, ureteral catheterization and perhaps pyelography before the diagnosis is narrowed down to the unsuspected urethra. Some experience and a fair review of the literature warrant the sub-title, "A frequently overlooked condition."

It would be well to use the endoscope more regularly before the cystoscope. When chronic urethritis is made out, the effect of applications of a 1 per cent silver nitrate solution, not oftener than once in five days, should be tried, together with a correction of the obvious cause, before exploring the bladder and ureters, unless the history makes it almost certain that the chief lesion is in the bladder or beyond.

The relatively uncomplicated chronic urethritis—be it a congestion of the mucous membrane or an hyperemia—is due to such causes as persistent hyperacid urine; oxaluria; glycosuria; overfunction consequent on neurotic polyuria; traumatism during parturition; the general pelvic congestion of menstrual disorders or of faulty sexual hygiene, and finally, the traumatism of crude catheterization for retention after operation or during incapacitating illness. Hospital nurses please take notice!

The one history offered as an illustration is that of an especially intelligent woman about fifty years of age, the mother of three children. For several years she had been having sudden attacks of pain referred to the "bladder region"—more especially to the urethra, accompanied by frequency of urination and tenesmus. The attacks lasted as long as two weeks. Between the attacks there was an intermittent dragging sensation in the urethra.

The attack in which I saw her had begun nearly three weeks before. A local physician had found the urine "loaded with pus and blood." This was unusual for her; a series of laboratory reports covering nearly two years, shown me by her family physician, gave no hint of blood in the urine. In spite of that favorable testimony and though the patient had never felt pain beyond the bladder, nor had vomited in the attacks, the recent history of pus and blood in the urine influenced me to begin by separating the urines. They were negative.

The cystoscopic picture, however, suggested that an adhesion, probably resulting from a suspension of the uterus for retroversion a few years before, had drawn the left side of the bladder outward, thus displacing the left ureter mouth. The ureter catheter, however, excluded stricture.

The urethra showed general congestion and two granular areas that oozed readily. Apparently continued hyperacidity of the urine was the primary cause in this case. The recent, unusually severe attack, characterized by pus and blood in the urine probably was due to a brief, self-limiting acute colon bacilluria.

Her general regimen was corrected and four endoscopic applications were made to the urethra. Following up the regimen seems to have kept her free from the previously frequent attacks.

Three years have elapsed without a recurrence.

As genito-urinary surgeons, we should record the existence of chronic urethritis in women and we should direct the general practitioners' attention to the fact that his irrigation of the patient's bladder is often misplaced treatment. He would do better to omit all local treatment, try out medication alone, and, if it fail, get advice. It is not necessary that these patients should go on suffering from the effects of so amenable a condition.

PARALYSIS OF THE BLADDER WITH ACUTE POLIOMYELITIS

HENRY G. BUGBEE

New York

The ever broadening field of urology, now embracing the study of the urinary tract in infants, must bring to light unusual lesions and the following case is reported to further stimulate such investigations.

The causes of retention of urine in infants are varied. Chute called attention to spina bifida occulta as an etiological factor. Young, Beer and the writer have described various congenital valve formations of mucous membrane at the vesical neck, prostatic obstruction and an enlarged verumontanum as an occluding factor. Diverticulum of the bladder and tumors have been reported in children and I wish to add this case as representing another type of retention.

A male infant, J. C., one year of age, was admitted to the Babies Hospital, New York City, October 17, 1923, suffering from retention of urine of twenty-four hours duration. On admission the parents stated that the abdomen had been swollen for twenty-four hours, that thirty-six hours previously he became restless and had been crying most of the time since. The child's diapers had been wet slightly for the greater part of the time, he apparently urinating in small quantities at frequent intervals. An enema had given but slight relief.

The child had suffered from no previous illness other than eczema for which he had been treated in the Hospital Clinic when three months of age. The history from the Clinic showed that his physical examination was then negative and at the Follow-Up Clinic in September, 1923, he was doing nicely.

On admission, the physical examination was negative aside from a marked protrusion of the lower abdomen. The temperature was normal; throat culture, negative; tuberculin reactions, negative; no paralysis of the muscles of the extremities. A catheter was passed by

the resident physician and 4½ ounces of urine removed, diminishing the size of the abdominal tumor, not all the urine being withdrawn. The urine was acid; showed a trace of albumin; acetone, two plus; no sugar; some hyaline casts.

Six hours later 7 ounces of urine were withdrawn and the following day the resident was unable to catheterize the child who was then seen by the writer in consultation. The bladder was then 1½ inches above the navel and extremely hard. The child seemed to be in pain.

Physicial examination at this time showed a right foot drop although the thighs and legs could be moved by the patient.

The blood count was: white blood cells 13,600; polynuclear 51; lymphocytes, 42; mononuclears, 3; transitionals, 4; eosinophiles, 1. Six cubic centimeters of spinal fluid were withdrawn under pressure and was cloudy, showed globulin two plus and 220 cells.

A diagnosis of acute poliomyelitis with paralysis of the bladder was made and corroborated by Dr. J. Ramsay Hunt, Consulting Neurologist of the Hospital. Catheterization was not advised but the suggestion made that the bladder be allowed to overflow. X-ray showed a normal spine.

During the next three days the bladder became more and more distended seeming to fill most of the abdominal cavity. He became progressively weaker, the paralysis extended to the extensor groups in both lower extremities resulting in double foot-drop; the temperature rose steadily and it was thought that the child would not survive if allowed to continue.

An anesthetic was administered and a cystoscopic examination made. No obstruction was found at the vesical neck; there was a protrusion of the posterior bladder wall, the mucous membrane over which area was gray on the surface and looked not unlike a growth.

The following day a suprapubic cystotomy was done which revealed a very large completely paralyzed bladder which was folded over upon itself, the posterior wall thickly covered with adherent pus and mucus.

Following the suprapubic drainage, the patient improved rapidly. A chart note one month later was: "the operation has accomplished the purpose splendidly. The bladder had been enormously distended and hard and it seemed a rupture was impending. The course of the poliomyelitis symptoms has progressed. There is atrophy of legs and thighs and bones though he moves both legs moderately, first pulling them up on the abdomen—at times playing with them. The extensor group is most affected. There is double foot-drop. He sits up in bed, looks bright and happy." Blood count normal.

During February, 1924, he developed a diphtheritic throat infection from which he recovered. On March 15, the blood urea was 15.4 mgm. and sugar 83 mgm. per 100 cc.

The bladder has been irrigated through the suprapubic tube which has been changed from time to time; it has also been clamped off for a few hours at a time but the child has passed but a very small amounts of urine on a few occasions through the urethra. A 15 F. sound passes through the urethra.

Just how much regeneration there will be of the muscles of the lower extremities is important. If the bladder function does return, the possibility of tendon transplant comes up. The left knee jerk has been obtained a number of times.

Since the widespread epidemics of acute poliomyelitis in 1915 and 1916, contributions to the literature on this malady have been almost continuous; paralysis of many individual groups of muscles have been described but no report of a case of paralysis of the bladder as the initial manifestation of the disease has been found.

DISCUSSION

Dr. GEORGE D. SMITH (Boston): I would like to say a few words about Dr. Pedersen's paper which it seems to me has a well chosen title. We have been particularly interested in this problem in the out-patient department at the Massachusetts General Hospital, because we have had so many cases come there in whom this was really the underlying cause.

About a year ago Dr. Cote and I wrote a paper with a report of 50 such cases. We found on looking up the literature that Le Fur and Nogues had studied several of these cases at autopsy and had found round-cell deposits in the submucosa of the female urethra simulating tubercles. Topical applications alone will not give permanent relief, and it has been our custom to alternate between cauterizing the urethra with strong silver nitrate, and dilating the urethra. The combination of these methods has seemed to give relief in cases in which uretheritis was at the bottom of the symptoms. It would be easy for the general practitioner to make this diagnosis because the urine is practically always normal, the bladder is easily distended and holds 300 cc. without trouble, which practically rules out Hunner's ulcer as the cause of frequency. Sometimes frequency is a symptom; sometimes there is no frequency, but extreme pain on voiding or immediately afterwards.

In looking into the causation of this condition it has seemed to us that preceding urinary infection has most often been at the bottom of it. That is, you would find a history of acute urinary infection; then the upper urinary tract has cleared up, but as a result of the infected urine passing over the urethra, or as a result of a general inflammatory condition, these round cell deposits have occurred and the condition has become chronic. We have had 2 or 3 patients where pyelograms have shown no dilatation of the kidney pelvis, and the urine at times is normal.

These cases have showers of colon bacilli in the urine, usually accompanied by an upset of the digestive tract, and at such times the urethritis becomes worse. We have tried autogenous colon vaccine in these cases and in 1 there seems to be a definitely increased resistance.

Dr. WILLIAM W. TOWNSEND (Burlington, Vt.): In the past there have been many interesting papers broadcasted from the Society; there will be more in the future. I think a most important message and one that should be broadcasted by the members of this Society has been given to us today by Dr. Cunningham. Those of us who are practising in rural districts see more frequently than we should, men with acute retention of urine, and their physicians in order to give them relief and full gratification empty their bladders completely, with the result that when they come to the Hospital they are pre-uremic or uremic and it is often a hard fight to tide them over and get them ready for a prostatectomy. I wish to emphasize the importance of Dr. Cunningham's paper. I believe that all of us should do our share in the education of the general practitioner as to the proper method to drain and withdraw urine from the bladder.

Dr. JAMES A. GARDNER (Buffalo): I want to speak along this same line. I was interested while in Baltimore last year, in an apparatus that one of the house officers had developed, to use when an indwelling catheter was necessary. A reservoir containing an antiseptic solution was attached, and it was claimed that an indwelling catheter could be used for two weeks—the urine remaining sterile during this time.

I have had a case recently that I wish to report in the discussion of hematuria. It is a case of alkaptonuria. Previous to the suprapubic cystotomy for drainage, there was nothing abnormal noticed in his urine. As soon as the urine became alkaline it resembled dark blood. We did not discover what the trouble was at first—two laboratories suggested indicanuria. Alkaptonuria does not affect the general health and on examination it will be found to be deposited in the cartilage. The cartilage of the ears is the most accessible place to find it.

Dr. Francis R. Hagner (Washington): I was very much interested in Dr. Thomas' paper. I have had 2 cases in the last year very similar, both in women with high blood pressure. One of these women had complete loss of sight in one eye from retinal hemorrhage; the other had partial loss of sight from retinal hemorrhage. They came in complaining of great frequency and blood in the urine. Ureteral catherization showed no blood from the kidneys; the bladder showed submucous hemorrhage. The vessels were convoluted as you see in high blood pressure in the retina. The blood was not clotted as in severe hemorrhage, and yet I have never seen patients suffer such excruciating pain—terrible frequency and tenesmus. After I examined them I made a diagnosis of arterial disease in the bladder and thought that was probably the cause of their symptoms. I tried local treatment but it had no effect at all. I kept them perfectly quiet and the high blood pressure was treated for a good while and they got better. The bleeding would stop and then recur, and neither one was relieved permanently by anything we could do.

Dr. Benjamin S. Barringer (New York): As To Dr. Thomas' case, it strikes me in the cases I have seen that it is the lack of muscular tone which causes the bleeding. We all see bladders full of blood clots and the bladder wall distended, and when you get the clots out the bleeding stops, but it does not stop until you get the bladder tone back again. I am wondering if some treatment like ergotin would not help in these cases.

Dr Cunningham's device I believe will enable us to save a few more cases. Dr. Bumpus very kindly took me over his cases some time ago, and I was so much impressed that I have been using his method as a routine since that time. I would like to ask Drs. Bumpus and Cunningham what the high blood urea was in the cases they have been able to save. We have been able to get it to 125, but beyond that we cannot go. I believe there are a few cases that with better apparatus and better technique such as Dr. Cunningham suggests, we will be able to save.

Dr. David W. Mackenzie (Montreal): I am very much interested in spontaneous venial hemorrhage. We find spon-

taneous hemorrhage in the mucous membrane as stomach and bladder, in parenchymatous tissue, as pancreas and kidney. We are much interested in the experimental work on vasomotor paralysis. It is quite possible that these things exist in the bladder as well as the stomach.

Dr. THOMAS F. LAURIE (Syracuse): I would like to discuss Dr. Bugbee's paper. Two years ago at the American Urological Association meeting, I reported a case of dilatation of the ureters and tried very hard to attribute that condition to poliomyelitis. I do not know how far it was true, but at that time I asked several men regarding the presence of urinary symptoms in poliomyelitis, and they all admitted they saw them in some cases, but that was as far as I got. There was no literature on it, that I could find.

Dr. HERMAN L. KRETSCHMER (Chicago): This group of papers should interest all of us because they have touched upon many border line problems. Much criticism has been directed against the various specialists because it is claimed they develop a narrow viewpoint in their work, so that when we have problems to solve which are not strictly urological or which are border line problems, it helps to keep us on our toes and gives us a broader point of view.

Dr. Bugbee's cases touch upon the field of pediatrics. The literature on this subject is scant, although pediatricians tell us that they see these cases ever so often. I know of one instance of a young man of twenty who has poliomyelitis with a paralytic bladder.

Dr. Thomas' paper was extremely interesting because it brings up the old question of the diagnosis of the cause of hematuria. This, of course, touches upon the field of internal medicine and helps to keep us in the straight and narrow path. Because of the nature of the lesion he no doubt considered the possible etiological rôle of systemic disease. These cases of bleeding are always very interesting. I once saw a patient who had hematuria due to a ruptured artery in his bladder. The bleeding point could

be seen very easily with the cystoscope. The patient had been bleeding for a long time and his hemoglobin was 32 per cent. It was decided not to operate and as a matter of emergency the bleeding point was fulgurated. This stopped the hemorrhage promptly and effectively.

Dr. Cunningham was very timely in calling attention to the fact that we must instruct the general practitioner in the practice of the gradual decompression of the bladder. I think the older men in this Society have been doing this for a long time. I think Dr. Cunningham's device is very ingenious.

Dr. Rathbun's paper is very instructive and recalls several instances in which patients were sent in for prostatectomy in which the symptoms were not due to the prostate, but due to the seminal vesicles. In other words, the possible rôle of the seminal vesicles in the production of symptoms had been overlooked before that patient came in, and it is easy, therefore, in cases in which this condition in the vesicles is overlooked, to understand why the symptoms should persist after the prostate has been removed. His group of cases emphasizes the necessity of more accurate and more careful differential diagnosis.

Dr. Pedersen's paper emphasized the great care that should be exercised in the routine examination of women. We always make it a rule to strip the urethra of all of our females patients, and furthermore always carefully examine Skene's gland, which, if pathological, i.e., red—is synonymous with antecedent infection, and if we find the presence of skenitis it causes us to look for evidences of urethritis, which may or may not be the cause of the patient's symptoms.

Illustrating the value of careful examination in women in order not to overlook the little things, I might mention a patient seen in consultation with Dr. Heaney, our gynecologist, in which repeated cystoscopics and careful examinations failed to reveal the causes of the symptoms for which the patient complained. A plastic operation had been performed as a result of which a part of the urethra was included in the sutures, with the result that a diverticulum of the urethra was formed. This was operated upon and the patient's symptoms promptly disappeared.

Some one spoke about high creatinin. The highest creatinin I have seen was 9.7 in an old man with an enormously enlarged prostate. We operated upon him in spite of the fact that he had a high creatinin. This man worked in a freight yard unloading heavy bags of cement before he came to Chicago to be operated upon, and I felt irrespective of his high creatinin he was a good risk because of the heavy work that he did.

Dr. A. H. CROSBIE (Boston): In 1916 I saw a young man with an acute anterior poliomyelitis similar to the case Dr. Bugbee reports. This was a young man of eighteen who developed acute retention very soon after the onset of the poliomyelitis and was catheterized several times. The bladder became infected and at the time I saw him it was quite evident that he was developing a pyelonephritis. It seemed wise in his case to give immediate and adequate drainage and we did a suprapubic cystostomy leaving the tube in. But eventually he died. I think there is no question in these cases that if you are going to drain the urine at all it should be done thoroughly and it can be better done by a cystostomy.

Dr. M. L. BOYD (Atlanta, Ga): Just a word about seminal vesiculitis after prostatectomy: First, I would like to express my appreciation of Dr. Rathbun's generosity in calling attention to my work on this subject. An important point in the diagnosis of seminal vesiculitis or vasitis is the recovery of the seminal secretion from the bladder after emptying the vesicles and vasa. The ordinary procedure is to collect the secretion at the meatus, which is entirely inadequate, because in the majority of cases, this secretion passes back into the bladder and must be voided or withdrawn by catheter. In prostatectomy cases where usually the bladder does not empty itself readily by voiding, it is always necessary to pass a catheter. Unless this is done, no clear idea is obtained concerning the extent of the vesiculitis.

As more studies like Dr. Rathbun's are made of the seminal vesicles and vasa after prostatectomy, I think the findings are going to have some influence on the type of prostatectomy which

is going to be done and upon the type of preliminary drainage of the bladder which we shall do. It seems certain to me, from my limited experience, that in a great many cases, the indwelling catheter either produces a seminal vesiculitis or prostatitis or accentuates that which already exists, while a preliminary suprapubic drainage does not do that.

The avoidance of the seminal vesiculitis and prostatitis produced by the catheter seems to me to be very difficult, and as we learn more about the details of the functional results after prostatectomy we are going to find such complications very objectionable. As Dr. Rathbun has pointed out, there is no question but that many of the symptoms after prostatectomy, which we ordinarily neglect to relieve, are really rather pronounced and annoying, and can be relieved by the treatment of the seminal vesiculitis and vasitis.

Dr. ARTHUR L. CHUTE (Boston): In connection with Dr. Bugbee's paper I wish to describe briefly a patient I saw some six years ago. She was a young woman of eighteen who had what the consulting neurologist said was a rather low, transverse myelitis. When I saw her she had been catheterized for three weeks; she had an overdistended bladder that contained 24 ounces of turbid urine. On the day of my visit, as well as the day before, she had had chills and a temperature that had reached 104; her left kidney was tender and large. One neurological consultant said that most myelitis cases died; the instances where the lesion was high, from interference with respiration, those where it was lower down, from kidney infection. He also said that there was usually a considerable tendency to have an improvement in muscular power as time went on. It seemed rational in this case to drain the girl's bladder by suprapubic incision in the hope that we could protect her kidneys until there was some improvement in the bladder muscle. We, therefore, did a cystostomy and kept the bladder draining for about six weeks; the patient did well and regained power to empty her bladder. The neurologist said that draining a bladder under such conditions and with such an object in view was unique in his experience. He was of the opinion that

the procedure had saved the girl's life, as it gave a chance to keep her kidneys moderately free of infection until such time as there had been an improvement or regeneration of nerve tissues sufficient to allow her to empty her bladder. Within a few weeks I have heard that this patient is quite well and has been able to go through two pregnancies safely.

I think Dr. Pedersen's paper is very timely. That sort of thing should be accentuated, because with our refinements of diagnosis we may be overlooking some things that the men of a few generations ago did not do.

As to Dr. Cunningham's paper, it seems to me that after all it does not make so much difference (and what Dr. Kretschmer has said strengthens my opinion) whether you do a suprapubic cystostomy or whether you draw off the residual slowly by catheter. If these patients have good hearts which will allow one to use sufficient fluid to remove the contaminating elements in the blood stream, they will, as a rule, get well; if, on the other hand, they have not sufficiently good hearts, they will go to pieces and it does not make much difference which method one uses. I believe everybody will admit that no matter what his favorite method of draining an overdistended bladder is he occasionally runs across patients in which it does not work well.

I was much interested in Dr. Rathbun's paper. It is new to me, but it seems to me it accounts for a lot of people who do not do well afterwards. I have several who I think would be improved by looking after them in that way.

Dr. H. C. Bumpus (Rochester, Minn.): Dr. Chute's reference to the cardiac condition in these patients interested me because during the past two years we have done electrocardiograms routinely on all patients with prostatic hypertrophy. In a certain considerable per cent there occurs an inverted T wave in derivation I, which Dr. Willius has pointed out indicates a fatal termination within two years in the majority of cases, a fact which should greatly influence the indication for surgery. Evidently when treating such patients by gradual decompression the utmost care will be associated with a certain mortality.

Dr. WILLIAM F. BRAASCH (Rochester, Minn.): I have been particularly interested in the source of hematuria which frequently appears following decompression of the over-distended bladder. In some cases the urine secreted from the kidneys is clear, so that it is evidence that the hemorrhage must have its origin in the bladder mucosa. A very marked hematuria is occasionally observed with acute infection of the bladder mucosa and the subjective symptoms may be comparatively mild.

It seems questionable that any antiseptic solution injected into the bladder following decompression could be of much value in preventing such hemorrhage. It is possible that a similar bladder infection explains the case that Dr. Thomas reported.

In regard to the contribution of Dr. Bugbee, in a paper which I am to read at Atlantic City three cases of poliomyelitis with evidence of secondary involvement of the bladder are reported. Of the large number of cases of poliomyelitis observed at the Mayo Clinic it is surprising how few cases have involvement of the urinary tract. I dare say this is explained by the fact that the centers of bladder control are situated in the lower segments of the spine. It was also noted in our cases that the motor power of the bladder was involved more than the sensory and that as these cases improved the motor control returned very rapidly.

Dr. GEORGE R. LIVERMORE (Memphis): In regard to Dr. Bugbee's paper, I am reporting a case of diverticulum of the urethra in a man of thirty-five years who had anterior poliomyelitis when he was five. I wonder whether Dr. Bugbee could throw any light on poliomyelitis as the possible etiological factor in this case. I am unable to account for it in any other way.

In regard to Dr. Pedersen's paper, it has been my experience that in most of these cases the urethritis was due to infection higher up, and that Hunner found more explanation than we are inclined to give him credit for. Those cases not due to infection higher up are due to old gonorrheal infection. We urologists are rather prone to overlook gonorrhea, but if we are more careful about examining Skene's and Bartholin's glands we will find the gonococcus is responsible for many cases.

In regard to the treatment I agree with Dr. Gardner that dilatation plus applications are more beneficial than applications alone.

Dr. NATHANIEL RATHBUN (closing): I think it is a question of interpretation of the conditions I have described in my paper, and possibly Dr. Kretschmer is correct and that it is chronic prostatitis and not vesiculitis. The same might be said of a post-prostatectomy. A certain number of prostatectomy cases present very annoying symptoms following operation which leave them about as uncomfortable as before, but they respond very quickly to massage and I have felt this came from an infected vesicle.

Dr. JAMES PEDERSEN (closing): I thank Dr. Smith for bringing up the pathology and adding it to my paper. I admit that an old time infection antedates the chronic uretheritis in many of these women; but my paper referred particularly to those cases in which there had been no antecedent infection. The urethritis I am discussing is found in virgins, young and old. These are the cases which are so often overlooked. I think it necessary to bring the subject to the attention of general practitioners, but we must get it also into our special literature. The general practitioner refers to our literature and he does not find simple chronic urethritis mentioned there, as fully as it should be.

SECOND DAY, MAY 27, 1924

EXPERIMENTAL RENAL TUBERCULOSIS WITH ESPECIAL REFERENCE TO EXCRETORY BACILLARIA

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Two statements are frequently found in the literature dealing with renal tuberculosis in the human being. The first is that tubercle bacilli may be excreted from a healthy kidney, without any tuberculous lesion being present in the kidney; the second that tuberculous lesions never heal in the kidney. To determine the validity of these statements the present work was undertaken with experimental animals. An objection may be raised that our observations are on animals, not man. One is impressed, however, with the similarity of renal tuberculosis in animals and man, especially with regard to distribution within the kidney tissue and with regard to the fact that the hematogenous route is preponderantly, if not entirely, *the* source of infection. In animals we are dealing, of course, with an overwhelming acute tuberculosis, while in man, especially the white and civilized races, we deal ordinarily with a chronic infection. The type of tuberculosis met with in the primitive races, such as the negro, comes much closer to animal tuberculosis.

TECHNIC

The rabbits used were given two intravenous injections of bovine tubercle bacilli, Penn State strain, ten days apart. The guinea-pigs used were inoculated in the groin with about 20,000 human bacilli, H 37. The animals used in this experiment were placed in metabolism cages and the entire urinary output was collected in twenty-four hour up to ninety-six-hour quantities.

The entire urinary specimens were centrifuged. The major portions of the sediment obtained was injected into the groin of healthy guinea-pigs. Smears were also stained and carefully examined for tubercle bacilli in the majority of the sediments.

When the animals died or were killed, thorough autopsies were performed, the tissues were microscopically examined for lesions and bacilli and the kidneys in every animal were serially sectioned regardless of the gross appearance of the organs. These serial sections were then thoroughly studied for lesions and bacilli. Over 30,000 sections were studied from the sixteen pairs of kidneys.

RESULTS

Four rabbits and 12 guinea-pigs were used. We grant the series is small but, with the tremendous amount of work involved in serial sections and the careful examination of these serial sections, we hardly felt justified in carrying on more animals. Seventy-three twenty-four hour specimens of urine were collected from the 4 rabbits. No tubercle bacilli could be found in smears. None of the 73 guinea-pigs inoculated developed tuberculosis. The autopsies of the rabbits forty-five days after inoculating showed tuberculous lesions in the lungs, liver and spleen. Serial sections of the kidneys showed no lesions suggesting tuberculosis in 2 animals. In 2 animals small lesions histologically suggesting tubercle formation were found, but, as tubercle bacilli could not be demonstrated in these lesions, the diagnosis of tuberculosis is not justified.

Of the 12 guinea-pigs used, 11 died of generalized miliary tuberculosis and 1 died of lobar pneumonia with small areas of tuberculosis in the spleen, liver, and lymph nodes.

From 9 pigs 16 forty-eight-hour to ninety-six-hour specimens of urine were collected. Smears showed tubercle bacilli three times and pus cells nine times. Of the 16 normal guinea-pigs inoculated with urine sediment 8 developed tuberculosis, 1 died of acute pneumonia without any evidence of tuberculosis and 7 showed no tuberculosis when sacrificed three months after inoculation.

Serial sections of the kidneys from the 12 guinea-pigs showed the following points:

1. Every animal whose urine proved infectious for tuberculosis in normal animals had tuberculosis of the kidney (lesions and bacilli).

2. In 2 animals tuberculous lesions were present in the kidneys and the urine was not infectious for normal animals.

3. In 2 animals, whose urine proved incapable of producing tuberculosis in normal animals, no tuberculous lesions were found in the kidneys. These animals had very extensive generalized miliary tuberculosis. Bacilli were numerous in the various organs.

4. Eight of the 12 pigs showed tuberculous lesions microscopically. Of these 8 pigs, the kidneys were normal in the gross in 3 and in 5 showed lesions which were suspected of being tuberculous. Of the 8 proving tuberculous on microscopical examination, 7 had bilateral lesions, 1 had unilateral lesions.

Having serial sections it was possible to determine the types of lesions. They were three in number, namely, cortical, pyramido-cortical, and pyramidal. The cortical was the most common and started in a glomerulus or in vessels situated in the stroma of the cortex. They are the least destructive generally but may cause considerable destruction of kidney tissue and lead eventually to discharge of tubercle bacilli in the urine.

The next in frequency is the pyramido-cortical. They generally resemble infectious infarcts. They are always destructive in character, especially in the pyramidal zone. There may or may not be tuberculous lesions peripheral to the pyramidal lesion, depending apparently on the promptness with which the blood current is obstructed. This type of lesion may also develop as a result of an extensive cortical lesion, draining into the pyramidal region.

The least frequent is the pyramidal lesion. This is also a destructive lesion and it shows no connection with a cortical lesion.

In 2 instances a lesion which had undergone marked fibrosis and apparent healing was found. After prolonged search one tubercle bacillus was found in one of the lesions and no bacilli

could be found in the other although one would not question its being a tuberculous lesion.

CONCLUSIONS

1. Serial sections are a necessity to avoid the overlooking of tuberculous lesions in the kidney.

2. No evidence to support the excretion of tubercle bacilli from normal kidneys was found.

3. The size of the tuberculous lesion is no criterion as to the number of tubercle bacilli in the lesion.

4. The absence of tubercle bacilli in the urine does not rule out renal tuberculosis. Their presence indicates renal tuberculosis, providing genital tuberculosis is ruled out.

5. There is a striking resemblance between guinea-pig and human renal tuberculosis.

6. The tuberculous lesions in the guinea-pig kidney are of three types. Their order of frequency is: (1) cortical, (2) pyramido-cortical and (3) pyramidal.

7. Tuberculous infection of the kidney is preponderantly hematogenous.

8. Individual tuberculous lesions in the kidney do heal. This condition is probably more common than at present recognized.

ONE HUNDRED FORTY-FIVE CASES OF RENAL TUBERCULOSIS

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This paper covers a review of 180 cases in which the diagnosis of renal tuberculosis was or should have been made.

The first group of 18 cases were diagnosed as renal tuberculosis and later a subsequent history and repeated examinations have proven them not to be tuberculosis. Three proved to be renal or ureteral calculi; 12 were only chronic pyelitis cases; 2 were pyogenic pyonephrosis, proven by operation later; 1 was undetermined two years ago and could not be traced. In none of these cases was the tubercle bacillus found either in the smear or by guinea-pig inoculation. The diagnosis was made entirely upon the clinical findings. In one case the diagnosis was largely made upon the X-ray findings. This group gives a diagnostic error of 9.4 per cent.

The second group contains 8 cases that were diagnosed as something other than tuberculosis and later were proven to be unquestioned cases of renal tuberculosis. Three were listed as renal or ureteral calculi, which they had; 2 were diagnosed as chronic pyelitis; 2 others were treated for acute gonorrheal urethritis, which they had and the tuberculosis was missed. One was put down as a pyogenic pyonephrosis and later operation proved it to be tuberculous. The error of this group is 4.4 per cent and when added to the first group makes a total known error in diagnosis of approximately 14 per cent. Three years ago this error was 20 per cent.

A third group of 10 cases should be considered by themselves, as the renal lesion was a very minor factor in their disease. In order to determine the percentage of genito-urinary complications in the admission to the Iowa Tuberculosis Sanatorium at Oak-

dale, Iowa, every case admitted is examined by one of our assistants, Dr. H. W. Scott. There were 10 positive urinary cases among the 207 admissions from September 4, 1923, to April 1, 1924. Of these 10 cases all but 1 had such an advanced pulmonary tuberculosis as to make even cystoscopy inadvisable. Four of the 10 had a history of urinary symptoms and 4 cases showed no pus in the urine. Of those 4 showing no pus, 3 are dead and the postmortem of one of them showed a bilateral renal tuberculosis. In this particular case the urine was negative for tubercle bacilli both by the smear and the guinea-pigs and the urinary history was also negative. The diagnosis, of course, was not made until autopsy. In a rather close association with this Institution over a period of nine years I have found only 3 surgical tuberculous kidneys admitted. An 11th case that was put in this group at first and which showed both pus and tubercle bacilli in the urine has since come to autopsy. Both kidneys have so far turned out to be negative for any tuberculous lesions, but there was a large tuberculous abscess of the pelvis including the left tube and uterus, and evidently the tuberculosis of the bladder was a direct extension from the pelvic infection. This case was one of complete bilateral duplication of the ureters.

The fourth group includes 145 cases in which the diagnosis has been definitely proven to be renal tuberculosis. Of these 145 cases the diagnosis has been made in 134 by finding the organism either in the smear or in the guinea-pig or both. In the remaining 11 cases the clinical dignosis was proven by operation in 3; by autopsy in 4, and in the remaining 4, the subsequent history was so definite that no doubt could exist.

Of the 145, 68 or 47 per cent have been quite definitely proved to be bilateral and 77 or 53 per cent have been equally definitely proven to be unilateral. This is a much higher percentage than ordinarily given. Of the bilateral cases 46 showed pus and tubercle bacilli from each kidney; in 12 there was no drainage from one kidney and the mate as definitely tuberculous. In 6 no complete cystoscopy was possible and 3 of these came to autopsy and proved the diagnosis. In 4 repeated positive guinea-pigs from the better of the two kidneys seemed to prove the diagnosis even though the other urine findings were very minor.

AGE

The average age of the 145 was thirty-four years, and there was no material difference between the unilaterals and the bilaterals in this respect. The youngest at the time of diagnosis was sixteen—a bilateral case with symptoms dating back to the age of twelve. The oldest was sixty-seven, also a bilateral. Seven were below the age of twenty; 38 between twenty and thirty; 55 between thirty and forty; 42 between forty and sixty, and 3 were over sixty. Sixty-four per cent were between the ages of twenty and forty.

As to sex, 98 or 67 per cent were males and 47 or 33 per cent were females. About the same proportion as to sex was found in the unilaterals and bilaterals.

SYMPTOMS

Bladder irritation in some form was mentioned in the histories of 125 or 87 per cent of the cases. In 60 per cent the frequency was either the only or the outstanding sign and was mentioned in the entrance complaint of 80 or 65 per cent of this group. In 44 cases it was so characteristic as to justify one in making a clinical diagnosis of renal tuberculosis on it alone. In all of these 44 cases it was of more than three months' duration in the shortest, and over ten years in the longest. In 33 or 23 per cent the bladder symptoms were so slight as not to make one suspicious of renal tuberculosis. Renal pain was never very prominent except in 2 cases and in one of these it was the only symptom the patient exhibited. It was definitely present in 14 per cent and in the majority was described as an indefinite dull ache. In 3 cases pain was present in the good kidney and absent in the bad one. Other renal symptoms mentioned were sensation of tingling, dragging or drawing in the region of the infected organ. One case, a woman with bilateral infection, seen three years ago, had complete retention of urine and had been compelled to depend entirely upon a catheter for over ten months. The cause of the retention was never determined, although the patient was under observation for nearly two years and was repeatedly cystoscoped

during that time. She is still alive and in fair health, but has to use the catheter sometimes as many as three times a week to keep herself comfortable.

Pulmonary symptoms were present in 31 of the cases and were very marked in 12 cases. In 7 of these cases the presence of pulmonary symptoms and findings, accompanied with slight urinary distress, really lead to the diagnosis.

Four cases exhibited no symptoms, whatever.

Other tuberculous lesions were noted as follows: Active pulmonary tuberculosis 31 cases or 27 per cent; evidences of old pulmonary tuberculosis 60 cases; tuberculous laryngitis 9 cases; rectal fistula 2 cases; joint tuberculosis 3 cases; epididymitis 39 cases or 27 per cent. A word should be said in reference to epididymitis. It was found at some time in 39 or 27 per cent of the cases and was next to pulmonary the most frequent associated lesion. In about half of the cases it evidently came after the renal infection. In 19 it was mentioned in the entrance complaint. We learned to suspect a kidney involvement wherever we found a tuberculous epididymis and we adopted the rule to catheterize the ureters of every tuberculous epididymitis case and to keep the patients under observation for as long a time as possible in order to either make the diagnosis or rule it out. Since this rule has been in force we have seen 24 cases that came primarily on account of the tuberculous epididymitis and of these 17 or 71 per cent showed involvement of one or both kidneys. I am sure that we would have missed at least 10 of these had this procedure not been carried out.

FINDINGS

The physical findings outside of those of the cystoscope and urine examination have been largely negative except for the evidence of associated tuberculosis as mentioned above. With few exceptions all of the cases were X-rayed and many pyelograms were made. The X-ray and the pyelogram have shown very few positive findings except in the advanced cases where the diagnosis was easily and positively made by other means. In the doubtful cases the X-ray gave negative results except in a very few cases.

In one case—auto-nephrectomy—absolutely the only evidence of renal tuberculosis that we had was a typical shadow and the diagnosis was made on that alone and proven to be correct at operation. In 9 other cases shadows were mentioned in the records, but none of these were doubtful cases. Approximately the same can be said about the pyelogram. In 1 recent case it made the diagnosis later proven by the guinea-pig. Pyelograms were made on only about 25 per cent of the cases. It is never done if we are sure or fairly sure of the diagnosis before hand, except in those cases of bilateral infection where we are in doubt as to the relative degree of destruction in the two kidneys.

There were records of cystoscopy in 126 cases and in 99 of these cystitis was mentioned as quite a prominent finding. In 16 other cases it was evidently very mild. In 31 definite ulcers were found. In 3 cases the ureteral orifice of the good kidney was involved in an ulcer. The bladder capacity was mentioned as being decreased in 90 cases. In 85 cases or 68 per cent the bladder changes were termed suggestive and in 42 cases or 33 per cent it was almost diagnostic. Another finding frequently mentioned was the retraction of the ureteral orifice.

Haematuria was present at some time during the course in 116 or 80 per cent and was the principal or main symptom in 9 cases. At the time of the examination it was usually only microscopic. In 2 cases it was gross and symptomless and led to a clinical diagnosis of bladder tumor before cystoscopy. When gross it was most frequently of the terminal type.

Pus was frequent in 138 cases or 95 per cent and varied greatly in amount. It was referred to as the so-called sterile pyuria in 61 or 41 per cent of the cases. The turbid urine of low specific gravity with few or no organisms found in the methylene blue smear was a very valuable finding in making the diagnosis.

The tubercle bacillus was found by the smear eventually in 132 or 91 per cent of the 145 cases. No acid fast organism was accepted as a tubercle bacillus unless it showed all the morphological characteristics of that organism. In all doubtful cases several samples of urine were examined independently by from two to four men and the greatest of care was observed in making the

smear and carrying out the technique of staining, especially destaining.

It is very important to keep in mind the fact that both the pus and the bacilli appear spasmodically in the urine and that the time for cystoscopy should be selected when you have the best chance of positive bacteriological findings. We observe the rule to examine the urine before cystoscopy is done and if pus is not present the examination is postponed. I know that I have done many useless and unnecessary cystoscopies by ignoring this simple rule. One case of this series illustrates this point very well. The patient —a strong healthy-looking male of 32 years—gave a history so typical that no other diagnosis except that of renal tuberculosis could be made. I saw him for the first time one afternoon and obtained from him three samples of urine–one at 2 o'clock; one at 3 o'clock and one at 4 o'clock. The 2 and 4 o'clock samples were loaded with pus and the smears showed literally thousands of typical organisms. The three o'clock sample contained much less pus and three different smears very carefully examined did not show a single bacillus. Two days later he was cystoscoped when the amount of pus in the urine was decreased. At that cystoscopy the left kidney smear showed considerable pus and a few tubercle bacilli. The guinea-pig was later positive from the left kidney. The right urine showed only a very few pus cells and no tubercle bacilli and the guinea-pig inoculated with this urine was negative. On account of suggestive lesions about the right ureteral orifice and a few pus cells in the right urine, a second cystoscopy was done six days later when the voided urine was found loaded with pus. At this cystoscopy a very turbid urine was obtained from both kidneys and all smears showed many tubercle bacilli and the 2 guinea-pigs were positive. Had the second cystoscopy not been carried out this patient might have been put down as one of unilateral renal tuberculosis. The outcome of the case showed that there was no difference whatever in the amount of infection in the two kidneys.

Another case reported with a definite tuberculous epididymitis and the urine showed some pus and a cystoscopy was advised. There were no bladder symptoms. The next day the urine was

clear and the patient was put under observation. For five days there was no pus and at about this time the epididymis and a largely destroyed testicle was removed. One day during the convalescence the urine was found to be turbid and he was immediately cystoscoped and a turbid urine, locaded with acid fast organism, was obtained from the left kidney. There were no findings in the bladder. On account of the controversy over the diagnosis, this patient was cystoscoped at two later dates—dates not selected on the basis of his pyuria— and each time the smears from the left kidney were negative for tubercle bacilli and pus and one time the guinea-pig was also negative. At operation three small abscesses were found in the left kidney. Two were buried deep in the kidney substance and one—the largest, being about 1 cm. in diameter—was in the medulla extending down into a papilla and separated at one point from the pelvis by only a very thin membrane. Evidently as the abscess filled up with pus the membrane ruptured and allowed the pus and organisms to escape into the urine and with the pressure relieved the ruptured membrane closed the cavity again. The patient was observed over several months and practically every time that the urine was turbid one had no difficulty whatever in demonstrating the organism and when it was clear they were entirely absent.

Guinea-pigs have been our greatest aid in the doubtful cases. Pigs were satisfactorily inoculated in 113 cases and were positive in 104 or 93 per cent. In cases where the pigs died too soon the procedure was repeated if there was reason to suspect tuberculosis. In 27 cases the pig was the first really positive evidence of the infection and I am sure that we would have missed the diagnosis in at least 30 or more of these cases if we had not had this evidence and our percentage of error would have increased to 30 or 35 per cent. In several of the cases after getting the positive pig we were able, by repeated examination, to finally locate the bacillus in the smear. In 7 cases the smear was positive and the guinea-pig was negative, but in none of these seven cases was the pig inoculated and the smear made from exactly the same sample.

Our rule is to inoculate a guinea-pig with every sample of urine obtained with ureteral catheter and the same applies to making a Ziehl-Nelson stain of the smear. In all suspicous cases repeated cystoscopies are done if the first is negative for the organism. In 1 case, with two small eroded areas in the bladder, 6 cystoscopies were done during the period of a year before positive findings were made. The first 5 were entirely negative and the sixth gave us 2 positive-pigs—one from each side.

Furthermore, a case should not be pronounced unilateral from one set of positive findings alone. If the bladder urine can vary from day to day in its bacterial content, then so can each individual kidney. That has happened repeatedly in this series. Some of the cases operated as unilateral that later in the course of three or even four years showed up an infection of the remaining kidney were very likely bilateral in the beginning. I am sure that repeated examination in doubtful unilateral cases has saved us many times in making errors in this respect and in a measure explains our comparatively, high percentage of bilateral cases. Some years ago I diagnosed a unilateral infection and cut down on the right kidney. It seemed absolutely normal. The patient was in very bad condition and I did not have the courage to remove, what looked to me, like a perfectly normal kidney. Four days after the operation he developed anuria and died and the autopsy showed a definitely bilateral infection most marked in the apparently good left kidney, the one from which I had obtained a urine negative for pus and tubercle bacilli.

Is it possible to make a diagnosis of renal tuberculosis in a kidney whose urine is persistently negative for pus but positive for tubercle bacilli? In this series there were 3 unilateral cases of that type and several bilaterals where the better of the two kidneys showed a urine without any pus. Two of the unilaterals were operated and both of them showed a positive kidney. One of these cases deserves mention. It was a male forty-five years of age who came in with a left tuberculous epididymitis. The urine was negative for blood and pus and there never were any bladder symptoms. Three ureteral catheterizations over a period of eight weeks showed three positive guinea-pigs from the left side,

but no pus or tubercle bacilli in the smears. The left kidney was exposed and although it showed every evidence of being normal it was removed. After the operation it was split open from pole to pole and no lesion was found. Five complete transverse sections were made and only the last one cut through a small abscess the size of a small French pea located in the medulla.

TREATMENT

Of the 145 cases 76 were considered operable—14 bilaterals and 62 unilaterals, leaving 69 inoperable. Of the latter 59 were bilateral and 10 unilateral. The bilaterals were considered operable on account of the great difference between the amount of infection in the two kidneys. The 10 unilaterals were considered inoperable on account of other foci of infection elsewhere found. In these cases it was felt that the removal of the kidney would have had no effect upon the progress of the disease.

In 76 operable cases 27 or 33 per cent refused operation. Six of them were bilateral; 21 were unilateral. Four of the bilaterals are now known to be inoperable and 3 of the unilaterals are known to be bilateral and probably inoperable. Three of the unilaterals are known to have been operated elsewhere.

Forty-nine cases were operated—8 of them bilaterals and and 41 unilaterals. Forty-six nephrectomies and 3 nephrotomies were done. Three of the nephrectomies were done by the two-stage method. These 3 showed very satisfactory improvement following drainage and made nephrectomy possible. In 2 of the cases I am sure the procedure made the actual operation much easier. In all 3 cases the kidney decreased very much in size. Of the 3 cases where nephrotomies alone were done, 1 died in the second week. The other 2 were done ten months ago. One case had an exophthalmic goitre and the other case was septic from secondary infection. In both cases the removal of the kidney at the first operation would have meant quite an extended procedure and the condition of neither patient would have permitted it. In both of these cases the improvement has been very marked and up to three months ago both refused

further operation. Both cases had very large palpable kidneys and in neither case could the kidney be palpated when last seen. One case has closed. This was an auto-nephrectomy when first seen.

Eight bilateral cases were operated—7 nephrectomies and 1 nephrotomy were done. The nephrotomy died in the second week. Of the 7 nephrectomies 3 were dead by the end of the second year, but these three were temporarily relieved of many of their symptoms and much improved in their general condition for many months. In two of the cases the bladder symptoms never did become distressing. The other 4 cases were very much improved in every way. In 3 of these 4 cases a negative urine and a negative guinea-pig was obtained within two years following the operation and it was thought at that time that the diagnosis of bilateral infection might be explained upon the basis of a reflux of urine in the good ureter, a condition that we always have in mind and which we try to guard against by repeated cystoscopies. However, each of these 3 cases have since shown positive findings in the remaining kidney. One bilateral case deserves mention. He was an unquestioned bilateral, operated five years ago. His condition at the time of operation was exceedingly bad. His bladder symptoms at that time were most intense and within a year following his operation they decreased to such an extent that they were almost negative. He has shown a gain of as much as 60 pounds in weight. The patient has been repeatedly seen on an average of at least twice a year and we have never obtained a sample of urine that has been negative either for pus or tubercle bacilli. Within the past six months his symptoms have started to gradually increase and he is now losing weight, but he has had at least an additional five years of comfortable life.

Of the 39 unilaterals who had nephrectomies there was one death eight weeks after operation. Two others died of pulmonary tuberculosis within two years. Twenty were alive and well three years or more after operation and 3 others were known to have been well two years after operation and have since been lost track of.

There have been then 3 operative deaths—2 being bilaterals and 1 unilateral, 1 resulting from a nephrotomy.

No special method of dealing with the ureter was carried out. As much as could be conveniently removed was taken out at the time of operation and the end of the ureter cauterized with carbolic acid. In none of the cases was it necessary to do a secondary resection of the ureter and no difference was noted in the healing of the wound no matter what was done with the ureter.

Four cases in which a very definite diagnosis of unilateral tuberculosis was made refused operation and are living and well, free of all their former symptoms and repeated examinations have been negative for all urinary findings, including smears and guinea-pigs. One of these cases has been free of all symptoms and findings for eight years. A second case has been free for five years, and 2 cases for two years. Three other cases went through this same process, but later their symptoms returned together with their findings.

TWO CASES REPRESENTING UNUSUAL TYPES OF RENAL TUBERCULOSIS

HENRY G. BUGBEE

New York

In no other type of kidney pathology are the lesions so varied and the resulting symptoms so often misleading as in renal tuberculosis. A diagnosis of renal tuberculosis may be impossible owing to extreme difficulty in carrying out diagnostic procedures at our disposal, or one may fail to make an accurate diagnosis in cases in which all methods of investigation are easily employed, as in the first case which I wish to report.

The patient, a woman, A. H., aged twenty-six married, first came under the observation of the writer, December 13, 1923. She gave a history of painless hematuria, continuous with exacerbations for a period of four years. Slight vesical irritability had been noted at the intervals when the hematuria was most marked, but bladder symptoms were never pronounced. Frequent urinalysis by her physician had revealed blood only. In various laboratory examinations no tubercle bacilli had ever been found, and guinea-pig inoculations had been negative.

The physical examination showed a rather pale, thin individual, of small frame. The teeth, tonsils, chest, abdomen and vaginal examinations were negative. The hemoglobin was 50 per cent.

Cystoscopic examination showed a normal bladder and ureteral orifices. The ureters were catheterized without difficulty. The urine from the right kidney showed numerous blood cells, few pus cells, staphylococci, on culture, no tubercle bacilli, no tumor cells. The urine from the left kidney was negative and the function of this kidney was five times that of the right.

A pyelogram of the right kidney at this time showed a moderate dilatation of the calyces with loss of outline of the minor calyces, the pelvic shadow being light in the center (a picture which had been noted in 2 cases of a papillary tumor of the renal pelvis).

The possibility of focal infection elsewhere in the body was eliminated. The patient was given pelvic lavage, urinary antiseptics, and constitutional treatment and did not again appear for examination until three months later. At this time she gave the same history of con-

FIG. 1. CASE 1. PYELOGRAM SHOWING FILLING DEFECT, SIMULATING PELVIC TUMOR, DUE TO ORGANIZED BLOOD CLOT IN RENAL PELVIS

tinuous bleeding. The hemoglobin was 42 per cent; otherwise the physical examination was negative. Blood urea was 14.3 mgm.

Cystoscopic examination gave the same picture of a normal bladder, the ureters were easily catheterized and the function of the right kidney was now found to be two-thirds that of the left.

The urine from the right kidney now contained blood cells and revealed many atypical epithelia; no pus cells or bacteria. The pyelogram showed a more pronounced light area in the center of the pelvis and a diagnosis of probable tumor of the pelvis of the kidney was made. A normal-sized kidney was easily removed through a lumbar incision. On section of the kidney a well-organized blood clot was found

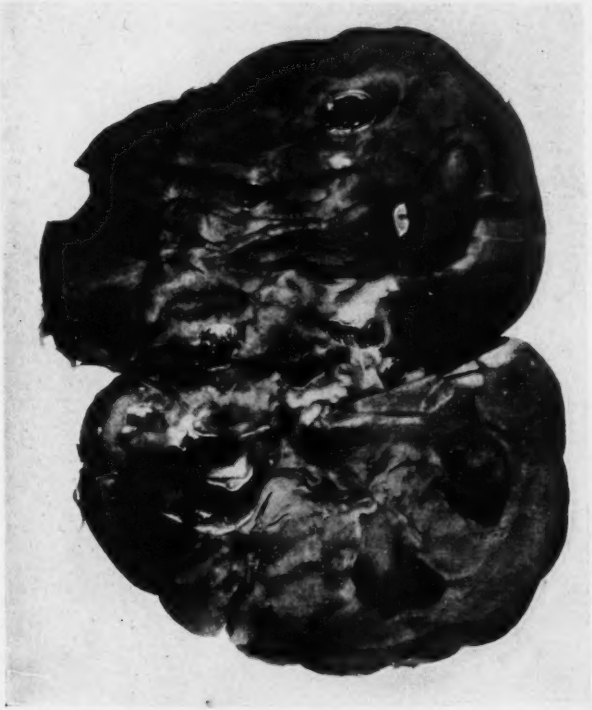

FIG. 2. CASE 1. KIDNEY AFTER REMOVAL OF CLOT

filling the center of the pelvis and extending into the calyces. This had caused the variation in density of the pelvic shadow in the pyelogram. The patient made an uneventful recovery. The pathological report of the specimen is as follows:

Macroscopical examination. Specimen consists of a kidney with 2 cm. of ureter. The kidney measures 7.5 by 3.5 by 3.5 cm. The surface

presents several cystic dilatations at the lower pole, but is otherwise smooth. Section shows the ureter apparently distended, with the

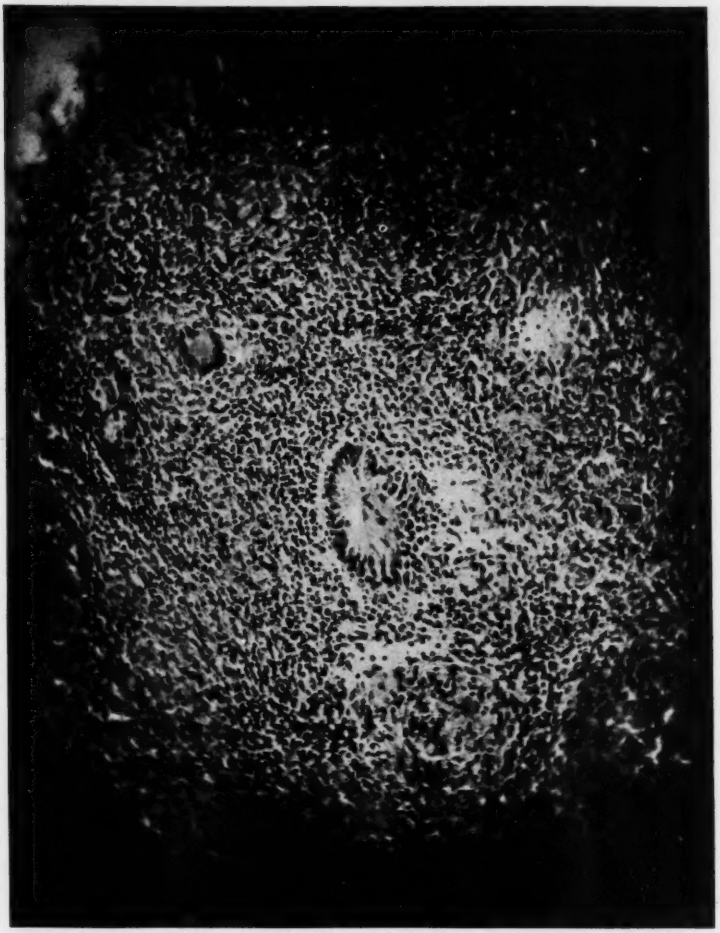

FIG. 3. CASE 1. FIBROSIS AND ROUND CELL INFILTRATION; SCATTERED TUBERCLES; NO CASEATION

formation of cavities evidently cystic dilatations of several calcyes at one pole. They are from 1.5 to 2.5 cm. in diameter. The pelvis

and some of the calyces are filled with a tenacious blood clot, and there are a few very slight ecchymoses in the mucosa of the pelvis near the ureter.

Microscopical examination. Sections from several portions of the cystic dilatations in the kidney show almost complete atrophy of the cortex at those points with fibrosis of the glomeruli and tubules as well. Large lymphoid deposits are found in this region.

The lining of the cysts shows an ulcerated membrane composed of fibrous tissue, endothelial cells and round cells, throughout which are scattered considerable numbers of discrete and confluent tubercles. There is practically no caseation, the tubercles being composed chiefly of endothelial cells and giant cells. The latter are fairly numerous, rather irregular, but a few of them are circular and clearly of the Langhans type. The infiltration with round and plasma cells is very extensive. The calyces which are less dilated show an inflammation also of the pelvic epithelium with occasional desquamation of a few cells, but marked round and plasma cell infiltration throughout.

There is extensive interstitial fibrosis of the pyramids, of numerous glomeruli, and round cell infiltration extending out along the course of the vessels as far back as the cortex, but isolated tubercles are not found in the kidney parenchyma. The small hemorrhagic lesion from the pelvis shows fresh hemorrhage and chronic inflammation, but no tubercles.

Diagnosis. Chronic tuberculosis of the kidney. Fibrosis without necrosis.

The second case was that of a woman of twenty-seven, married three years, had two children. The family history was negative. She had an operation for inguinal hernia nine years ago. No other illnesses.

On entrance to the hospital, October 18, 1922, she complained of severe pain in the right upper abdomen and back of one week's duration, diarrhea, chills, fever, and swelling of the feet, no urinary symptoms. Temperature on admission 104, pulse 134; respirations 36. Physical examination showed a heavily coated tongue; a dilated heart giving a loud systolic murmur, apex beat strongest in the fourth interspace and irregular; moderate edema of the feet and ankles. There was a large tender mass in the right upper abdomen and lumbar region unquestionably a kidney.

Cystoscopic examination revealed a moderate congestion of the vesical neck and the right ureteral orifice was not functioning. A catheter passed to the left kidney, the urine collected showing a normal function on this side and an absence of infection; on the right side the catheter was obstructed at 22 cm. from the bladder, no urine was obtained. Roentgenograms revealed an oval shaped calculus 2.5 cm. long by 1.5 cm. in width lodged in the right ureter opposite the third lumbar vertebra.

FIG. 4. CASE 2. REPLACEMENT OF KIDNEY TISSUE WITH FAT

Under local anesthesia a right lumbar incision was made exposing the kidney mass. The tumor was incised and found to consist of a thinned out cortex surrounding a dilated pelvis and calyces which contained about 8 ounces of thick foul smelling pus. The patient's condition did not warrant further exploration. A large tube was inserted into the kidney pelvis and the wound closed about it.

Aside from the first few days after operation, during which time the heart action was irregular and weak, the patient's condition improved slowly and she was allowed to leave the hospital on November 22, 1922, to return for general observation and dressings of the discharging

sinus in the right lumbar region. The discharge from this sinus had been constantly decreasing and then consisted of thin pus and apparently no urine. The blood urea was 13.4 mgm. per 100 cc. of blood.

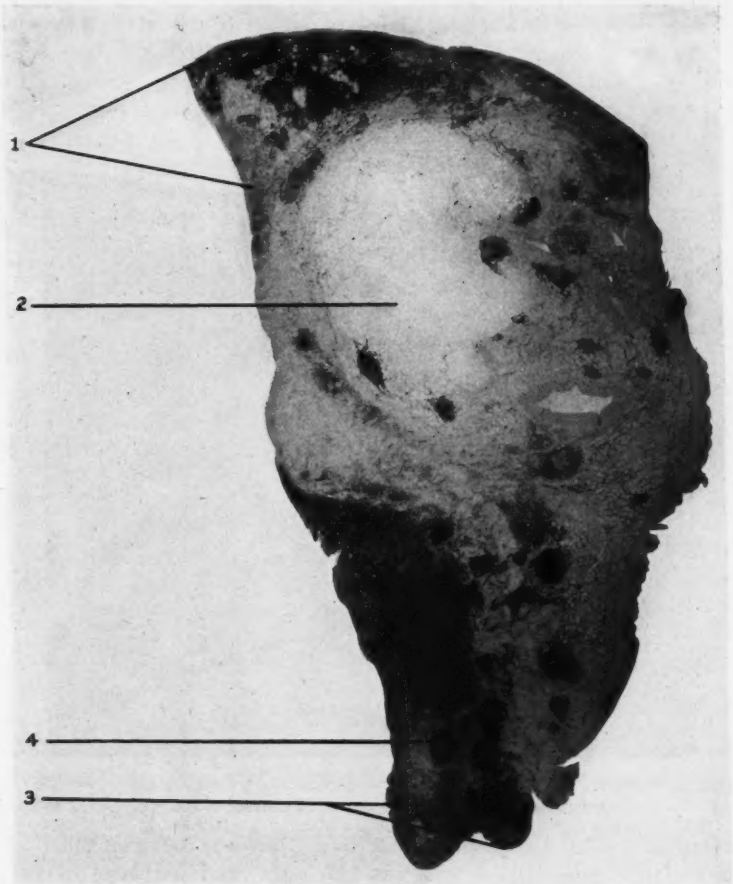

FIG. 5. CASE 2. SHOWING (1) COMPRESSED KIDNEY SUBSTANCE, (2) FAT, (3) APEX OF MEDULLARY PYRAMID, AND (4) TUBERCLES. × 10

The patient was under observation until February 14, 1923, when she re-entered the hospital. During these three months her general

physical condition and especially the cardiac condition improved steadily. She had no urinary symptoms and no discharge of urine from the lumbar sinus. Occasional discharges of thin pus were noticed however and a roentgenogram showed the ureteral calculus lodged in the pelvic portion of the right ureter. Cystoscopic examination showed

FIG. 6. CASE 2. SHOWING (1) COMPRESSED KIDNEY TUBULES, (2) COMPRESSED GLOMERULI, (3) TUBERCLES, AND (4) BLOOD VESSELS. × 72

a bladder and left kidney free of infection. And an absence of function on the right side. Blood urea was 12.6 mgm. and phthalein output 55 per cent in two hours. The temperature was normal, pulse range 80 to 90 and respirations normal. There was no edema of the lower extremities.

Under gas-oxygen anesthesia, the right kidney was removed through a lumbar incision with surprisingly little difficulty considering the former operation and the extensive suppuration present at that time. The wound was closed about a drain and the postoperative history was uneventful. The temperature rose several times to 101 the pulse never above 100. The patient was discharged cured on March 21, 1923.

The kidney specimen in this case is of especial interest. What appeared at the first operation to be a pyonephrotic kidney secondary to a ureteral obstruction, when removed at the second operation, presented an unusual picture. The gross appearance was that of a hypernephroma which, however, was not substantiated by pathological examination.

The pathological description of the specimen is as follows:

Gross appearance. The specimen was a globular mass which had been opened through the center and measured 13 by 10 cm. in diameter. The outer surface was irregular with adherent perirenal fat. The cut surface was smooth and glistening and showed white strands outlining irregular, pink lobules which had yellow fatty centers. The largest of these fatty areas was about 4 by 3 cm. in diameter. There were no softened areas but a few small red, shallow depressions were present. One such depression or cavity existed between the growth and a much compressed piece of kidney substance at the upper pole. No adrenal was found. There was little in the mass to distinguish it as kidney.

Microscopic examination. Just under the kidney capsule was a zone of cellular connective tissue in which lay a number of small round and elliptical tubules lined with a single layer of regular, cuboidal epithelial cells. Most of the tubules were empty, some contained hyaline material. There were also many glomeruli with greatly thickened capsules and capillaries. The lumen of a few capillaries could still be distinguished by means of the nuclei in their lining cells. Between these compressed glomeruli and tubules was much diffuse mononuclear cell infiltration. Some hemorrhage had occurred, probably traumatic at operation. A number of round tubercles, composed of mononuclear and epithelioid cells, with a small amount of coagulation necrosis were found in this zone, which represents compressed kidney cortex. Giant cells were few in number. The tubercles were more numerous in the compressed kidney medulla and several were present in one medullary pyramid which had partly retained its shape and whose apex was covered with stratified epithelium. In other places, the walls of the

kidney calyces were greatly thickened, studded with tubercles and calyx cavity filled with fat. Thus the yellow areas are accounted for.

The lesion is one of chronic tuberculosis, probably bovine in type.

Since leaving the hospital, the patient has had a miscarriage and curettage during which time pus cells were found in the urine. At the present time she is free of symptoms and in good physical condition.

FIG. 7. CASE 2. SHOWING (1) ROUND CELLS AT PERIPHERY OF TUBERCLE, (2) EPITHELOID CELLS, AND (3) COAGULATION NECROSIS. × 72

The outstanding features of this case are the sudden onset of the symptoms, with the ureteral obstruction, the extremely poor condition of the patient when first seen, the rapid improvement after drainage of the kidney and the pathological study of the kidney after removal, showing almost complete replacement of kidney tissue by fat and the chronic low grade tuberculous in-

fection in the thin compressed cortex with the absence of previous urinary symptoms or secondary lesions of the ureter and bladder.

These 2 cases presented a chronic tuberculous inflammation of the kidney, almost free from necrosis, with no cavity formation and with no involvement of the lower urinary tract. No tubercle bacilli could be isolated by examination of the urine or demonstrated by guinea-pig inoculation. In one case the symptoms and findings seemed to be characteristic of a tumor of the renal pelvis with persistent hematuria as the predominating symptom, and in the second case the kidney was almost entirely replaced by fat.

They demonstrate a type of infection quite different from the usual picture of renal tuberculosis with active lesion in the lower urinary tract and its accompanying distressing urinary symptoms. They lead one to believe that tuberculosis of the kidney probably exists much more frequently than is generally conceded, that a correct diagnosis of this type of case is often overlooked, and that such a low grade tuberculous renal infection is self-limiting in some cases.

A CASE OF DOUBLE KIDNEY WITH TUBERCULOSIS AND CALCULI

THOMAS P. SHUPE

Cleveland, Ohio

Among the anomalies of the genito-urinary tract, duplication of the ureter and pelvis is the most common. This duplication may be either unilateral or bilateral, either complete or incomplete. The unilateral incomplete or bifid ureter occurs quite frequently (68 per cent), while the complete unilateral occurs in 32 per cent.

These anomalies would be of no interest except as curiosities were it not for the fact that pathological changes are so apt to occur. The pathology is generally that of stasis plus infection, and sometimes associated with stone. It is a case of unilateral bifid ureter with pyonephrosis associated with tuberculosis and calculi which I wish to present to you.

The patient, a man aged forty, presented himself first on December 14, 1922. His complaint was pus and blood in the urine with extreme frequency both day and night; the family history was negative. There was nothing of importance in his past history except that five years ago he had had a small epithelioma resected from the lower lip; his general health had been good up to the onset of the present illness, which began in May, 1922, while patient was in Europe. He stated that he first noticed pus in his urine which began to increase in quantity and became quite profuse. His health in the meantime became impaired and his appetite became poor; at that time he consulted a physician and received some medical treatment which apparently relieved his symptoms.

About two months ago he was troubled with nocturia seven to ten times a night; two weeks ago all his previous symptoms returned with increased severity; he stated that he has had a large amount of pus in his urine and that there was also some bleeding; there was also some pain at the end of urination. He complained of having occasional

pains in the back in both kidney regions but especially over left side; he had lost weight, his present weight being 90 pounds (usual weight 120); there was no history of night sweats, chilly sensations or afternoon temperature. Patient states that he had consulted several surgeons and urologists for his trouble, but after examination operation had been refused.

Physical examination showed a very poorly nourished but well developed man of forty; he did not appear acutely ill; temperature normal. Examination of the chest revealed a thorax that was flat in type; its symmetrical expansion was excellent on both sides; ausculation revealed breath sounds vesicular in character; no râles present. The abdomen showed slight degree of resistance in the left subcostal region, giving the impression of a mass in that territory, possibly the pole of the left kidney; posteriorly there was a definite tenderness on heavy percussion over the left kidney region; the prostate was soft and somewhat tender, size about normal; seminal vesicles were not palpable.

X-ray showed seven or eight distinct shadows in what appeared to be the lower pole of the left kidney; this pole extended well down to the pelvic brim. The urine contained much pus and numerous colon bacilli; the non-protein nitrogen was 51 mgm. per 100 cc. the urea was 24; the combined 'phthalein output was 35 per cent the first hour and 12 per cent the second; appearance time was seven minutes from intravenous injection.

The first cystoscopic examination revealed a rather dense scar in the posterior urethra, necessitating the use of a very small catheterizing cystoscope, and a contracted bladder holding 75 cc. of fluid; the bladder was intensely inflamed and edematous; the mucous membrane covered over with slough, requiring several washings to get a clear field. Examination was not prolonged due to the pain and no attempt was made to catheterize either ureter. Patient was then put on daily vesical irrigations and large quantities of water internally.

A week later, under gas anesthesia, the bladder was again inspected through the cystoscope and the condition of the mucous membrane found to be somewhat improved. A large scarred orifice was seen on the left side into which a catheter could easily be inserted; very thick, cloudy urine was obtained from this ureter. This pus was so thick that it had to be aspirated through the catheter. Nothing could be seen of the right ureteral orifice at this time. This urine from the left ureter contained tubercle bacilli and it was evident that he had advanced tuberculous pyonephrosis on the left side with either stones or calcified masses present in the kidney.

Our next problem was to prove the presence of another kidney and its condition. The patient was extremely nervous, losing in weight and it was impossible to make any further examination of his bladder without gas anesthesia. Accordingly he was sent into the hospital and, after irrigating his bladder for a few days, another examination was made. The bladder was still too much inflamed and distorted for us to make out the right ureteral orifice. One week later this was tried again; by this time the bladder would hold slightly over 100 cc. of fluid and under gas anesthesia we were able to insert a catheter into the right ureter. From the right kidney we obtained fairly clear urine, normal rate and amount. The 'phthalein appeared in five minutes and there was an output of 20 per cent in half an hour from intravenous injection. This urine contained a few pus cells and some colon bacilli. It is now evident that there is not a perfect kidney on the right side and the question is: Will the right kidney sustain life if the left one is removed?

Following this examination the patient had a temperature ranging from 100 to 103; his abdomen was very slightly distended and had the feel and appearance of a tuberculous peritonitis. On several examinations it was thought free fluid could be made out in the flanks.

After another eight days rest in bed, the abdominal symptoms and fever subsided, the patient seemed to be in fairly good general condition and it was decided to remove the left kidney. Under nitrous oxide and novocain, a long oblique incision was made under the left costal region. The kidney was slightly adherent but was easily freed from its surrounding fat. There now appeared to be two distinct portions of the kidney, the upper one being fairly normal in appearance with slight scars situated over the cortex; the lower part of the kidney was a pyonephrotic sac containing stones and pus. The line of demarcation between the two was quite distinct and the upper portion could have been easily dissected from the lower. Two ureters were then found, one leading to each portion of the kidney; the ureter from the upper portion ran posterior to the lower one. The patient was a very thin individual and it was possible to trace the ureters down to the brim of the pelvis where they united.

The question as to whether the kidney should be taken out or the lower portion resected was then considered. In view of the fact that the cortex of the upper better portion of this kidney showed a few scars and retracted areas over its surface and the fact that we had found tubercle bacilli in the urine on this side led us to remove the entire kidney.

Both ureters were clamped off and cut with a cautery, the lower ends being tied. The pedicle was then cut between clamps and ligated with a ligature on a needle. The wound was closed with a small rubber tissue drain. Patient lost almost no blood during the operation and was in good condition upon leaving the operating room.

His temperature for the next few days went as high as 101, pulse was never over 96 and his respirations were 20. The urine output following operation was 850 to 1500 cc. daily. On the sixth day after operation his temperature was normal and patient was improving rapidly. He left the hospital on the fourteenth day after the operation in very good general condition; the wound had entirely healed his appetite had returned, he was gaining in strength. The pathological report by Dr. Swanbeck briefly is as follows:

"The kidney measures 11 by 6 by 5 cm.; the upper portion of the kidney is rather nodular and capsule strips with some difficulty. The section shows kidney tissue in which there is marked fibrosis with numerous small focal collections of pus cells. The renal epithelium shows considerable cloudy swelling throughout and the cortex also shows numerous small miliary abscesses. In the lower half of the cortex the kidney tissue is almost entirely replaced by a fibrous sac containing a fairly thick pus and seven or eight well rounded stones. The pre-operative diagnosis was pyonephrosis of the left kidney with tuberculosis and calculi; colon bacillus, pyelitis of the right kidney of a very mild degree, and a tuberculous cystitis."

Postoperative diagnosis was the same with the exception of the double kidney and bifid ureter.

I recently saw this man—in April of this year. His weight is 130 pounds, having gained just 40; the urine still contains a small amount of pus, the bladder capacity however, is good, being 300 cc. He rises once at night to void. The case has been interesting to me in that it required so many examinations to make the partial diagnosis and from the fact that he had been almost refused any operation whatever.

If a pyelogram had been made of the left kidney, we would probably have discovered the bifid ureter; however, in view of the fact that the examinations had to be made under gas and that the patient was so sensitive and weak, and we knew he had a pyonephrosis on the left side, a pyelogram did not seem to be indicated in this particular case.

The two outstanding problems in the case were first to prove before operation that there was another kidney capable of sustaining life if the infected kidney were removed. This was fairly difficult due to the infected contracted bladder and the general condition of the patient. The second problem arose when the double kidney and ureters were discovered at operation, whether to resect the pyonephrotic sac from the upper kidney, a procedure entirely possible in this case, or to do a nephrectomy. In view of the fact that tubercle bacilli had been found on one occasion in the urine from this kidney, and further, that the cortex of the better upper portion presented several small healed scars, we removed the entire kidney. The infected portion has often been resected with fair success. Braasch reports four cases out of thirty operated upon for double kidney in which heminephrectomy was done. Of the 4 cases, 2 later required nephrectomy for infection, a percentage certainly too high to warrant this operation except in extremely favorable cases.

DISCUSSION

Dr. WILLIAM F. BRAASCH (Rochester, Minn.): This Society is to be congratulated upon the series of most interesting papers that we have to discuss this morning. That phase of renal tuberculosis dealing with the possibility of its bilateral occurrence is of great interest to me. Originally it was thought that renal tuberculosis was always bilateral; later it was regarded as usually unilateral; more recently again it has been shown from clinical evidence that is was probably more frequently bilateral than we supposed. It was clearly shown this morning, from both the laboratory and the clinical side, how frequently bilateral renal tuberculosis occurs.

In the paper read last year at San Francisco I called attention to the fact that guinea-pig inoculation made from the supposedly well kidney was followed by a positive tuberculous infection in a large number of cases. Beer and his associates had previously reported a similar experience and explained it by reflux of tubercle bacilli from the bladder. Judging from postoperative results, we are inclined to believe that the tubercle bacilli demonstrated in the urine from the supposedly well kidney were due to active renal tuberculosis in that kidney. It all goes to show that one should not rely upon any one method of examination, but employ all the tests from fuchsin stains to guinea-pig inoculation, as well as renal function tests and urography.

I was surprised to hear Dr. Alcock say that pyelography was of little help in the diagnosis of renal tuberculosis. In our experience it has been of the greatest help. He said he employed it with bilateral infection in order to ascertain which kidney was the more diseased. It seems questionable whether it is necessary to employ pyelography very often for this purpose. If we cannot ascertain from ordinary cystoscopy which kidney is the more diseased, I do not think the patient is operable. Oper-

tion for bilateral tuberculosis is only justified when there is a very marked difference in the function of the two kidneys.

I would like to ask Dr. Medlar several questions, if I may. Has he ever seen a case of healed renal tuberculosis? The tubercle in the guinea-pig kidney that he showed is apparently healed. Did he use further animal inoculation with the substance from the healed tubercles in order to corroborate this point? Also, has he ever seen a healed lesion which had completely disappeared so that no evidence of its previous existence could be found on either gross or microscopical inspection? It would seem possible that a minute fresh tubercle could heal entirely, leaving no trace of pathological evidence.

I was also interested to learn that the cortical involvement was so predominant, which, while it is quite contrary to Halle's hypothesis nevertheless corroborates clinical experience.

Dr. ALEXANDER RANDALL (Philadelphia): I think we ought not to lose sight of the work done by Halle on renal tuberculosis which was reported in 1916 and 1917. Dr. Hamer, if I am not mistaken, repeated this work, reporting the same to us a few years ago, and it is of extreme interest to see how closely Dr. Medlar's results, working from the experimental side, also match up with Halle's conclusions. Halle stated that there were only two types of renal tuberculosis; one a parenchymatous infection, the other a pyelitic one. The latter was the most active and productive, while the former he claimed occasionally underwent complete sterilization and even healing. The sections which Dr. Medlar has shown us are the only ones I have knowledge of, which establish such a possibility from the experimental laboratory, and substantiate this conclusion of Halle. Dr. Medlar has shown not only apparently healed lesions, but border line states, undoubtedly tuberculosis, where healing has progressed to the point that only an occasional giant cell tells of the existence of a previous active tuberculous process. Moreover, these are the cortical lesions and my feeling is that clinically we never see them in consultation.

Dr. Bugbee's second case was along the same line. Some years ago I found an unusual kidney at autopsy that consisted of nothing but a cheese-like mass. The patient had been thoroughly studied for over five months and died of unquestioned pernicious anemia. There was no history of tuberculosis, and the complete autopsy proved that he had no tuberculosis present. This kidney was completely destroyed by what could be nothing else than tuberculosis, and here, as in all these cases, the proof of cure rested on the fact of the absence of the tubercle bacillus, their absence being essential to the conclusion that the lesion was healed. I think the kidney that Dr. Bugbee showed, if it had not been removed, in the course of time of that individual's life, would have become a completely healed tuberculous focus, though a completely destroyed organ.

We are far from the final answer on renal tuberculosis, and Dr. Medlar's paper forms, I feel, an important link in the chain of evidence, as to the progress and localization of such an infection.

Dr. Thomas P. Shupe (Cleveland): I think Dr. Medlar's paper is very interesting. There is one thing I wish he would discuss, and that is whether the tubercle bacilli, like the giant cells, build up a protective zone. In some of the healed lesions it may be that the tubercle bacillus has built up this surrounding protective zone for its own benefit and has simply died in the attempt. Dr. White of Washington has put out some work on this subject recently that is very interesting.

Dr. Arthur L. Chute (Boston): Dr. Medlar's paper has been of great interest to me in that it has shown that certain conditions are produced experimentally which I have felt sure, judging from clinical observations, must happen in the natural course of renal tuberculosis. We have known that renal tuberculosis is, unfortunately, bilateral in a number of cases. Dr. Medlar has given us definite experimental proof of this.

The frequency with which Dr. Medlar has found healed cortical lesions in his experimental work has, I believe, a very great interest from the etiological point of view as well as an importance

from the surgical standpoint. It accentuates the importance of keeping up the general resistance of a patient from whom one has removed a tuberculous kidney because of the possibility of an unrecognized cortical lesion in the other kidney, which will probably heal if properly cared for, but which may go on to the destruction of the kidney if the patient's general condition is allowed to fall below par.

I have described before two instances in which calcifying, and I believe healing, tuberculous lesions, confined to the cortex of the kidney, were seen in an X-ray. They were supposed to be renal stones and were cut down upon; in both instances the calcified areas were curetted with the result that in one case I removed a much disorganized tuberculous kidney a short time later. In the other instance, a case seen in consultation, the stirred up kidney was removed but the patient died of an acute miliary tuberculosis. I have no doubt that both these cases represented a healing process which, if left alone, would have gotten well. They represented instances of renal tuberculosis, but they were not instances of surgical, renal tuberculosis.

Dr. Alcock reports removing a kidney in which there was a very small tuberculous lesion and no great discomfort. This brings up the question of just why we remove a tuberculous kidney. I think we all agree that when a diagnosis of renal tuberculosis has been established we cannot often expect that the involved kidney will heal in the sense that we will have a cessation of the inflammatory process, until what is practically a total destruction of the secreting tissue has taken place. This fact that the involved kidney is practically doomed to destruction may in itself be a sufficient reason for its removal. I do not feel that the presence of a tuberculous focus in a kidney is in itself a necessary indication for its immediate removal. It seems to me, in fact, that there are some cases in which the patient can with advantage be given the use, so to speak, of the diseased kidney for some time.

It is my belief that a tuberculous involvement of the badder is the most imperative indication for the removal of a tuberculous kidney. If the bladder involvement is allowed to become too extensive, it will rarely be possible to make the patient comfortable again.

Dr. Bugbee's paper has interested me very much. I have been misled by the peculiar appearance of the pyelogram in a case in which the renal pelvis was filled with clot. I believed that I had to do with a tumor of the renal pelvis and did a nephrectomy in a patient in whom the bleeding was probably due to a nephritis. I have seen in at least two instances of kidneys in which, following an inflammatory involvement, there had been a complete infiltration with fat, all secreting tissue apparently being replaced by fat.

In Dr. Shupe's case I cannot help wondering why he did not employ either sacral or spinal anesthesia for his cystoscopy. It seems to me that sacral anaesthesia is especially adapted to this.

Dr. A. H. Crosbie (Boston): I would like to call attention again to the work of Dr. Spooner some years ago on the urines and also the kidneys in cases of renal tuberculosis. He took catheterized specimens of urine from the infected kidneys and made cultures and smears from it; then he took the kidney after it had been removed and made cultures and smears from that kidney. In his series he found that only one showed a mixed infection. He found no mixed infection either in the urine or in the kidney itself. The only case in which he found a mixed infection was in a kidney that had previously had a nephrostomy done and the secondary infection undoubtedly occurred at that time. His observations covered a series of twelve tuberculous kidneys.

Dr. Francis R. Hagner (Washington, D. C.): We do not want the impression to go out from this Society that we believe in waiting for tuberculosis of the kidney to heal. I do not think we want the profession of this country to get that idea. I believe every case in which we can diagnose tuberculosis, the kidney should be removed, if by our study we find that the other kidney is not involved.

Another point is the occurrence of the tubercle bacilli in the urine without tuberculosis in that kidney. Experimentally, that may occur; but I would like to ask any man in this audience

if he has ever seen a case in a human where tubercle bacilli were present in the urine, operation done, and no tuberculosis found in the kidney. I have never seen such a case. If we find tubercle bacilli in the urine I believe the patient has tuberculosis of that kidney. We had a woman recently who had perfectly clear urine with no pus in a centrifugalized specimen, yet this urine was teeming with tubercle bacilli and at operation a definite lesion was demonstrated.

Dr. HOMER G. HAMER (Indianapolis): I have enjoyed these papers very much. I have been especially interested in the subject of the spontaneous cure of renal tuberculosis since Dr. Mertz and I made a study of Halle's hypothesis a few years ago. We had opportunity to study several cases of closed tuberculosis bacteriologically, and in one of them where there was cyst formation in connection with caseation we made a guinea-pig injection of the fluid and got a positive inoculation. There the active tuberculosis was still present, although well walled off. We got the impression that wherever there is exclusion there is always a suspicion that tuberculosis still exists, although it may correspond to Halle's classification of a cure.

We have followed the routine of removing the excluded kidney if there were symptoms of bladder disturbance, because so many of these patients develop a toxic nephritis on the opposite side unless the diseased kidney is removed.

Dr. J. DELLINGER BARNEY (Boston): I believe renal tuberculosis offers more of a problem than we have ever supposed. I think in the first place we are very much misled by the fact that the text books say we must have certain symptoms, and we look for these symptoms. I have seen two cases in the past year where there were no symptoms at all such as described by the text books, and where even repeated guinea pig inoculations and smears were negative, but where operation was done and tubercle bacilli demonstrated in the kidney.

I think it is surprising how often bilateral tuberculosis occurs. In the last few years I have seen several cases in which after care-

ful study bilateral lesions were demonstrated. It is also surprising how in the presence of bilateral lesions these men and women can go along with perfect health, gaining weight, without symptoms except pyuria, for a long time.

In a case where tubercle bacilli and pus are demonstrated on one side and pus alone on the other side we can be sure of the diagnosis in the one side only. But in a case where there is only pus we may be missing the tubercle bacilli. We may have pus in the opposite kidney presumably caused by toxic nephritis, but in one case we found out later that the tubercle bacilli were present in the kidney and that we had been missing them by all tests known. So I think in cases of known tuberculosis on one side and with pus on the other side we should think a good deal more than we have as to whether there may not also be tuberculosis in the other kidney. It seems to me there is no question which we have to deal with which presents more difficulties than this.

I think Dr. Medlar has thrown more light on the early stages and the path of the tubercle bacillus than any paper I have heard for a long time, and if we could only carry on that work and confirm it we would have a great deal of light thrown on our clinical observations.

Dr. Edgar M. Medlar (closing): I might say that this work was undertaken as a result of an argument with a genito-urinary surgeon over a case upon which he operated. A positive guinea-pig inoculation was obtained in the laboratory from a ureteral urine specimen. With this report he removed what to him appeared to be a normal kidney. He cut the kidney to pieces and was unable to find a tubercular lesion. He claimed that the bacilli in the urine were excreted from a normal kidney and consequently threw doubt upon the value of the laboratory findings. The kidney was so mutilated that the pathologist was not given a chance to make a careful gross examination.

The question of Dr. Braasch. Of course these healed lesions in the kidney which we have described are so small that it would be difficult to be certain of them from gross examination. There is a question in my mind whether tuberculous lesions of any ap-

preciable size heal. In the human cases it is always a question whether they will heal in any considerable portion of cases. Undoubtedly there is a lot of healed tuberculosis that could never be detected grossly and still microscopical evidence might be present. It seems futile to try to obtain these healed lesions and inoculate them into guinea-pigs.

There are two very interesting points to mention in regard to the guinea-pigs. One is that they had such an overwhelming infection. There were lesions everywhere and many of these animals had numerous lesions in the kidneys. Second, to me it was quite interesting that, in spite of this overwhelming infection, we should be able to find evidence of healing of individual lesions in the other organs as well as in the kidneys.

In answer to the question asked by Dr. Chute, will state that I do not agree with Dr. White, that the tubercle bacillus calls out the endothelial leucocyte, which phagocytes act as a protection for it against the other defensive mechanisms of the body. It seems to me that this inflammatory reaction on the part of the body is entirely for the purpose of walling off the infection and of destroying the infectious agent.

Dr. NATHANIEL G. ALCOCK (closing): In regard to pyelography, I said it had helped us some in doubtful cases. There are two types of doubtful cases, the early and the quite late. In the early cases where there is a relatively small amount of infection, pyelography is of little or no value, but in the quite late cases, where the organism is hard to find and there is considerable secondary infection, we think pyelography is of very great value.

Dr. Chute asked why I removed the kidney in the case where the only evidence of infection was the three positive guinea-pigs. I removed that kidney because we fully believe, first, that a tuberculous kidney will not get well, and second, that if you can consistently and definitely demonstrate tubercle bacilli coming from a kidney it is tuberculous.

I expected more to be said about the matter of reflux in these bilateral cases. We have always had that in mind and wherever we have had doubtful findings we have tried to check it

up by repeated examination. In some cases I have felt that our bilateral findings were due to reflux but subsequent examinations following nephrectomy have proven that they were originally bilateral.

Dr. THOMAS P. SHUPE (closing): About the only reason I did not use a sacral spinal anesthesia was because I generally get better anesthesia with gas.

I am a firm believer in pyelograms. I think they should be done in most cases. I plan to do all my cystoscopy on the X-ray table so the patient need not be moved before having the X-ray made. But in this particular case I was just a little fearful about putting anything in that kidney.

INJURY TO THE VENA CAVA DURING NEPHRECTOMY

REPORT OF FOUR CASES

ARTHUR L. CHUTE

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It has been my fortune to meet 4 instances in which, during a difficult nephrectomy, there has been an injury to the vena cava. These cases have seemed to me of sufficient interest to warrant bringing them to your attention.

Case 1. This patient was seen with Dr. Edmund H. Stevens in 1909 and I am indebted to Dr. Stevens for permission to report it. The patient, a woman of forty-eight, had been operated upon three weeks before I saw her and a very large collection of pus opened, that involved both the right kidney and the perirenal tissues. Examination showed the right kidney was of little value, with an occluded ureter, while the left kidney was practically normal. An abdominal nephrectomy was done; dense adhesions made the separation of the kidney very difficult; the pedicle was clamped and cut; in tying the pedicle it was found that the clamp had included a bit of the cava below the renal vessels and that this had been opened. This cut was about 0.5 cm. long and bled smartly. A stitch was passed through the edges of the incision and tied both ways, but as this was not satisfactory the point of injury was lifted with forceps and a ligature tied about it; this controlled the bleeding perfectly. The lumen of the cava was definitely narrowed but the patient made an uneventful convalescence and left the hospital in four weeks in fairly good condition. She died nine weeks after reaching home of some acute disease, the nature of which was not determined.

Case 2. In the case of a man of forty-four with a right hypernephroma, a loin exploration had been made by another surgeon in May, 1919. There had been some bleeding and it was decided that it was unwise to attempt the removal of the growth. In October, 1919, the patient having learned the nature of the trouble, sought operation.

Transperitoneal incision; the kidney mass was slowly separated; adhesions of the old loin scar added materially to the difficulty of this. After tying the pedicle I found that there was a place above the pedicle from which dark blood welled up in large amount. This proved to be a longitudinal tear in the vena; a clamp would control the bleeding. I made a hurried and unsatisfactory attempt to close the opening in the cava by means of suture, then as the condition of the patient was very poor I packed the wound, apparently successfully. The patient oozed some following operation, failed steadily, and died three or four hours later. No autopsy was obtained.

Case 3. A woman of sixty-four who had had urinary symptoms for a year and a half came under my care at about the same time as the preceding case, that is, in October, 1919. There was pus in the urine; a mass in the right loin; a right ureter that would not permit the passage of a catheter, and a left kidney that excreted normal urine in good amount. Loin incision: kidney adhesions very dense; opened into kidney during its manipulation and let out some pus; felt a big stone in the kidney pelvis. In separating the lower pole I started sharp bleeding; clamp applied; pedicle secured, and kidney removed. In going over my field I found that one of my clamps was on a small longitudinal rent in the vena; this opening was below the renal pedicle; the rent was tied with silk and the clamp removed; there was no bleeding. The patient's condition on leaving the table was poor; she was given subcutaneous salt solution and stimulants. Late that night she collapsed; she had no radial pulse, was pale and restless, though the dressing showed no evidence of hemorrhage. She was transfused; given 750 cc. of blood; she improved for a time, but died twenty-four hours after operation. There was no outward evidence of bleeding, though no autopsy was secured.

Case 4. A woman of thirty-seven seen in December, 1923; she had had her gall-bladder removed a short time before; shadows that had been seen in her radiographs had been supposed to be gall stones but no stones were found and the shadows persisted following operation. A pyelogram of her right side showed the bromide solution surrounding the stone shadow; the function of her left side was good. Loin incision; because of the long-standing perinephritis it was very difficult to determine the various relations; ureter identified low down and followed up to the pelvis. Separation of some dense adhesions on the inner side

of the ureter was followed by sharp bleeding; the blood was very dark. Examination showed a lateral tear in the wall of the vena, about 1 cm. long; this was controlled by the use of a small clamp. The kidney was then removed and pedicle secured. I closed the tear in the vena with two or three fine silk sutures, but there was too much oozing from about the stitches to make me feel safe. I felt that a ligature applied about the rent after pulling up the vein at that point would perhaps occlude more of its lumen than would be wise. I, therefore, put a small right angled clamp on the vena practically over my line of suture. A wick was carried to the bottom of the wound and the wound was closed about the wick and clamp; the clamp was loosened on the eighth day and removed on the ninth; there was no bleeding and the patient made an uninterrupted recovery.

Such a search of the literature as I have been able to make would seem to indicate that injury to the vena cava during nephrectomy was a relatively infrequent occurrence while my own experience would lead me to believe that it is probably not a very rare happening.

Petit in a Paris Thesis in 1912 reports a case in which a tear in the cava was closed with a stitch and he reviews the literature up to that time. He does not confine himself to tears that were made during nephrectomy though the majority were due to this cause. He cites the different expedients that had been used to remedy the condition: packing in a few cases; the application of forceps; lateral ligation of the vena; double ligation of the inferior cava and lateral suture of the vena. He was of the opinion that the suture of the tear gave the best results: he collected 19 cases in which a lateral suture of the vena had been carried out with 17 recoveries. In one of these cases the incision was given as 9 cm. long, while in another it was 6 cm. in length.

Guerry in 1913 reported in the Southern Surgical and Gynecological Transactions 3 personal cases in which the cava had been injured during a nephrectomy. He also cited a considerable number of cases from the literature. In Guerry's cases forceps were left on the injured vena. In all 3 cases the forceps were unlocked on the seventh day and removed on the eighth; all the cases recovered.

In the second of Guerry's cases the accident occurred during the removal of a *left* kidney; the description of the case is very brief and does not make it quite clear to me just how the accident happened. In all the other reported cases of injury to the vena during nephrectomy, if my recollection is correct, the accident has followed the removal of a right kidney. Beside Guerry's 3 cases of injury to the cava, 4 other cases were reported in the discussion of his paper. In 1 a clamp was placed on the vessels (this case was fatal), in another, reported without details, it was simply stated that the injured cava "was clamped" and that the patient "recovered." The other 2 cases also recovered; in 1 the rent in the cava was sutured; in the other a lateral ligature was applied.

Arthur T. Cabot in 1912 reported 2 personal cases in which he had injured the cava during a nephrectomy. In 1 of the cases the opening was closed with two silk sutures; in the other case an attempt at suture was made but was not successful so a clamp was applied which was removed in a week. Both patients made a good recovery.

Phillips in 1917 reported a case in which the vena cava was opened during a nephrectomy. An attempt was made to close the rent but his sutures did not hold and he closed the opening by putting on two clamps, side by side. These were left in place for fourteen days. The vena was diminished one-third in size. For a month this patient suffered from dropsy of her legs and for some menstrual periods she lost what she estimated was four times the usual amount of blood, but this was decreasing at the time the report was made.

The injury to the cava is apt to happen in the separation of the dense adhesions which often bind the lower pole of the kidney to the vena: one is not aware of opening the vein but suddenly finds large amounts of dark blood pouring into the wound.

In certain cases of tumor the mass has slipped from the operator during enucleation and has pulled off the renal veins at their junction with the vena. In other cases the clamp on the pedicle has been placed in such a way as to include a lateral bit of the vena either above or below the renal pedicle or both above and

below it. Last as in my second case the tear may be above the pedicle. I have found reference to five different methods that have been employed to meet this calamity.

The earliest method was that of tamponing the wound; so far as the reported cases go, this is the least efficient. Petit reports 3 cases, 2 of which were fatal; adding my second case, we have 3 fatal cases out of 4, a mortality of 75 per cent on such recorded cases as I have found. I do not, however, doubt that many unrecognized wounds of the vena have been successfully treated this way, but this is simply my opinion.

Lateral ligature was used in only 3 instances of the cases that Petit collected and 1 of these died. It was successfully used in a case reported by Stone in the discussion on Guerry's paper, also in the first case I reported. In the case I reported the lips of the injured vena were pulled out a little with a forceps, the suture passed through the edges and then tied first in one direction and then in the other, while gentle traction was being made with the forceps. I believe this is a safe method to use in the case of a small tear, provided one uses a silk ligature. I should not care to use catgut for such a ligature.

Another method which was used in a considerable number of the earlier cases was that of total ligation of the inferior vena cava, sometimes with one ligature, sometimes with two. About as many of these cases lived as died. It was found that if the upper ligature was placed above the left renal vein, the patients all died, that renal function ceased at once; that if, however, the ligature was placed below the renal vein a good proportion recovered though a considerable number had some temporary edema of the lower extremities following it, and that the women were rather prone to flow profusely for a time after operation.

I believe the best method to use in these lateral tears of the vena is that of suturing the edges of the tear with silk, by preference. This will be easy to carry out in some cases when one has an anterior incision and the patient is not too heavy: all but impossible in cases where we have a loin incision and a deep wound So far as the technique of suture is concerned a small rent may be closed with a single stitch; a longer one will usually require

two layers of stitches; one opening of 9 cm. has been successfully closed (Zoege von Manteuffel). Silk is, I believe, the safest suture material to use. So far as I can see it makes no difference whether one brings intima or adventitia together; two layers of suture are safer than one. Almost all lines of suture will ooze for a time but the pressure in this case is so low that a gauze sponge held against the suture line for a short time will usually control the ooze.

The last method of treatment that has been used to any extent in the repair of the injuries to the cava is the application of artery forceps in such a way as to hold the edges of the tear in apposition, the method I employed in my last case. Strangely enough, this method gave very poor results in the cases collected by Petit; only two recoveries in seven cases. It has, however, been largely used in the more recent cases and has seemed to have given excellent results.

In the 3 cases reported by Guerry the clamp method was used: in 1 of the 2 cases reported by A. T. Cabot the clamp method was also used; likewise clamps were used in 2 of the cases reported in the discussion of Guerry's paper. In 1 of these the result was not successful. In a successful case reported by Phillips clamps were left on for fourteen days. Taylor reports a case of injury of the vena cava due to a fragment of a bomb in which he pleated the vena cava over some little distance, using 7 artery forceps to hold the edges together. On the fourth day he anesthetized the patient and removed the clamps one by one; there was slight bleeding with the removal of the last. This was controlled by packing which was removed two days later. A month afterwards the patient was doing well. The advantage of this method is that it can be applied very quickly and easily. The disadvantage is, of course, that the wound must be left open with the forcep handles projecting. The ordinary straight clamp is used in most cases. In my own case I used a clamp with a right angle curve. I think this curved top makes it unnecessarily hard to remove the clamp and I doubt the wisdom of using this type of a clamp. As for the time of removing the clamps, the various people have left them on from four to fourteen days. The case reported by

Taylor where the clamp was removed on the fourth day was the only one where there was any oozing and the oozing in this instance was of no importance.

CONCLUSIONS

Wounds of the vena cava will occur occasionally in nephrectomy. They may occur when every apparent care has been taken in carrying out the operation. These wounds are probably best treated by suture, whenever this is possible. In a certain number of cases we shall probably find that this is impossible and will have to depend on bringing the edges of the incision together with forceps. It is wise to leave these clamps in place for at least seven days.

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TECHNIC FOR AN ACCURATE PERFORMANCE OF THE DIFFERENTIAL KIDNEY FUNCTION WITH PHENOLSULPHONEPHTHALEIN

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There certainly is no question among us as to the value of the differential phenolsulphonephthalein test in kidney pathology and diagnosis. I believe it might be truthfully stated that in this country the surgery of kidney diseases depends more on this test alone than on all the other advocated methods of study combined. Its greatest asset lies in the feeling of security that accompanies its measure of renal function, and those who do not use it routinely to the degree of dependency which I have indicated, probably fail to do so because of the fact that the test as ordinarily performed has failed them through technical errors for which they themselves were responsible. Men might differ on the operability of low function readings, but a normal phenolsulphonephthalein gives an assurance of the presence of functioning tissue which might be called upon, that nothing else does. If you are willing to grant me this statement as an uncontrovertible fact, its sequel is that accuracy of performance when doing this test becomes an absolute necessity. For the past two years I have watched and questioned numerous men from various clinics as regards the technique utilized and have been surprised to find that none seem to be taking advantage of a method that we have practised for over nine years, to what I might call complete satisfaction. I have found that almost universally the method followed in other clinics is bilateral ureteral catheterization with No. 6 catheters followed by intravenous injection and collection of specimens. In a series

of 10 consecutive test cases, mostly in normal individuals, we have followed this technic, and have had to face an error in 60 per cent of the total, i.e., in only 4 out of 10 cases did the test work perfectly. This error was due to leakage past one or both catheters, rendering an accurate estimate of differential function impossible. This leakage varied from 2 to 15 per cent and averaged in the total 10 per cent. I do not know whether this percentage of error is excessive; it is what we got in a small series done under supposedly perfect conditions, some with the cystoscope in situ, some with it removed, and always waiting to start until both catheters were functioning actively.

TABLE 1

Bilateral catheterization. Sixty per cent error

		TIME OF APPEARANCE	PER CENT RIGHT	PER CENT LEFT	PER CENT LEAKAGE
		minutes			
10360	Normal	4	25	25	0
A3305	Chronic prostatitis and stricture	4	20	20	0
A3535	Tuberculosis (?)	2	20	20	0
A1050	Chronic prostatitis	3	20	20	Trace
A3628	Early middle lobe hypertrophy	3½	20	20	2
A838	Stricture of urethra	3½	5	15	10
A4340	Chronic prostatitis and stricture	3½	15	30	10
A4655	Chronic prostatitis	5	Trace	10	10
8206	Chronic prostatitis	4	10	18	15
A3535	Tuberculosis (?)	3½	15	20	15

In 1915, Pelouze in an obscure publication (1) first called attention to an accurate method of technique, and again in a second short article in 1917 (2), he mentioned it in describing the "cystoscopic fin" now familiar to you all, following its adoption by Wappler in their new convertible instrument. With the exception of a splendid article by H. McClure Young (3) further publicity as far as I know has not been given to the method either in journal or book publication. In fact, several articles have described novel techniques advocated to avoid error: methods that though they might obtain this one desired result, at the same time detract from the test other valuable

assets, and but exemplify the fact that under ordinary working conditions the test is at times most unsatisfactory.

It is hardly necessary to do more than point out certain basic principles, familiar to you all, in the performance of this test. First, collection should be simultaneous from both kidneys and consist of exactly the same interval of time. Second, the test should start when the dye is *first* secreted from either side, as this represents the onset of elimination and foretells that at that moment it has been presented to both organs to do with it what they may. Third, gross percentage elimination over a measured period of time allows of a measure of differentiated function comparable to a known standard or norm. Fourth, the test should end simultaneously for both kidneys. Fifth, intravenous administration facilitates the work, shortens the time of the test and, if combined with absolute accuracy, may be used against a known standard of the normal for greater information.

The technique consists of the routine use of a large (11 F.) Garceau catheter in one ureter, the secretion from the opposite kidney being collected either per cystoscope or by immediate catheterization of the bladder at the termination of the test. Personally, I prefer the former, as by its means the time of appearance of the dye from the uncatheterized ureter can be determined per cystoscope drainage, the efficient occlusion of the catheterized ureter can be maintained, and just before the time limit of the test is reached, the bladder can be repeatedly lavaged to secure all phthalein presented by the un-catheterized side, and render accuracy practically errorless.

The choice of side in which to place the Garceau catheter is open to discussion. Where it is possible to determine it, we prefer that it be placed in the side supposed to be free of disease; or in the ureter of the better of the two kidneys when bilateral disease exists; or in the ureter of the one on which surgery is not contemplated.

The reasons for this choice are as follows: (*a*) It is of as great, or greater, consequence to know accurately before operating not only the extent or location of disease, but the functional

value of the kidney that is to be left to carry on the body's work. By complete occlusion of this ureter and its absolute testing, the operator feels safe, or properly warned, as to conservative surgery on the operating table. (*b*) Any leakage that may possibly occur, errs on the side of safety and is in favor of the diseased organ. (*c*) There is no disturbance to the diseased side, no blockage of the catheter by pus, no temporary anuria from trauma to a laboring organ, no leakage about a catheter in a dilated (tuberculous) ureteral orifice. This diseased

TABLE 2

Check cases of unilateral catheterization with Garceau catheter

NAME	DATE	TIME OF APPEARANCE		PER CENT RIGHT	PER CENT LEFT	CONDITION
		Right	Left			
		minutes	*minutes*			
J. W. L.	February 17, 1923	10	14	30	15*	Left renal calculus
	February 20, 1923	6	12	23*	10	
R. D.	March 22, 1920		6	25	17*	Pyuria, pulmonary tuberculosis; renal tuberculosis (?)
	March 30, 1920		8	25	20*	
	July 10, 1920	6		30*	17	
F. J. K.	May 25, 1922	10		2*	15	Bilateral renal calculi; left pyonephrosis
	June 5, 1922		12	7	15*	
	April 23, 1924	11		5*	30	
	April 27, 1924		8	5	20*	

*Garceau catheter in that side.

and uncatheterized side is left to perform its best work as it that day is doing it, be it either partially functioning or totally obstructed. (*d*) The question of carrying infection to a well organ is answered by the fact that generally 5 to 8 cm. only of a Garceau catheter causes complete occlusion in the vast majority of cases; active diuresis and catheter function eliminates the possible danger; nor have we observed any such sequelae to follow, and where bilateral catheterization is the routine, this danger is not considered of importance. (*e*) It is decidedly best not to catheterize the diseased side at all when performing the

cystoscopy for differential function testing, as any manipulation or trauma may cause temporary blockage or anuria and where error has entered this work in our hands it has always been in patients on whom we attempted the collection of separate specimens before doing the test.

One further added advantage of this technique that has probably the greatest appeal, is the saving of time to both the patient and the urologist. Is anything more discouraging to the patient and disappointing to the surgeon than the finding of 15 per cent of phthalein in the bladder after an hour's earnest work; vitiating results; destroying confidence; necessitating repetitions and manifold explanations; delaying operation and unless another method is employed, what is there to hinder the same occurring a second or even a third time? We have become so confident of our ability to gain the information desired, an absolute and final answer as regards differential function at the initial performance, by this method, that the operating day is often set before the test is done, feeling sure of the ease and confident of accuracy of the one performance. In particularly difficult problems we often repeat and then cross-catheterize at the second cystoscopy, while ordinarily at either a previous or subsequent cystoscopy a double catheterization is performed for separate specimens for laboratory study in conjunction with a routine pyelography. In other words, one should be able to count upon two cystoscopic examinations, each of short duration, to fulfil all the necessary requirements in the average differential kidney study, if such an accurate techique becomes standardized.

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SOLITARY FUSED KIDNEY

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A review of statistics dealing with the frequency of occurrence of various congenital anomalies of the genito-urinary tract shows a wide discrepancy in the figures. It was believed, formerly, that congenital anomalies of the uro-genital tract were uncommon. This was due, no doubt, to the fact that these cases were infrequently reported, and when reported were almost always autopsy cases. With the increasingly larger number of autopsies that are performed every year, it stands to reason that many of the various anomalies of the genito-urinary tract will be noted with greater frequency, and clinical cases will increase in frequency, because of the decided advance in urological diagnosis. Since many men are working in this particular field today, the natural outcome will be that more and more cases will be found and reported, in which event the present available figures in regard to the occurrence of the various congenital anomalies of the genito-urinary system, will undergo revision and more accurate figures will be established.

Solitary fused kidney is one of the rare types of congenital malformation, hence its infrequency on the post-mortem table. Stewart and Lodge found but 1 example of unilateral fused kidney in their series of 6500 autopsies. As further evidence of the rarity of this condition they quote Henry Morris who found one fused kidney, other than horse-shoe shape, in 15,908 autopsies. Boody found 1 case of solitary fused kidney in 500 autopsies, the only authority to report such a ratio.

Anomalies of the kidneys are of two kinds: (1) Supernumerary, in which three separate kidneys are present, each with a separate pelvis and each with a separate vascular supply. This is an

exceedingly rare type of anomaly.[1] (2) Cases in which only one kidney is present. The nomenclature of this type of lesion has been confusing and misleading. Great care should be used in describing cases belonging to this group.

A careful differentiation should be made between solitary fused kidney and cases in which there is congenital absence of one kidney. In the latter instance one renal bud has either not developed at all or has remained in a rudimentary condition without blastima formation and sprouting, while the opposite bud has gone on to the formation of a single kidney, which, by its size, makes up for the deficiency of the opposite side. These cases generally have but one ureter with one ureteral orifice in the bladder. Where ureteric variations occur a differentiation is called for. If complete reduplication of the ureters of such a single kidney should occur, with congenital absence of the opposite kidney, both ureters would empty on the correspond ing side of the bladder. The trigone on the opposite side would show no trace of an ureteral orifice, or only a blind recess.

In solitary fused kidney the fusion may be so complete that the resulting compound organ closely resembles in shape and general appearance a single kidney with complete ureteric duplication. The differentiation is based on the fact that in solitary fused kidney the ureters terminate normally in the bladder instead of both on the same side.

Solitary kidney should always be interpreted as one kidney with its pelvis and ureter, and this name should be reserved only for congenital cases. Cases in which the opposite kidney has been removed surgically should *never* be classified as cases of *solitary* kidney. "Solitary fused kidney" should always indicate cases in which the renal mass consists of both right and left kidneys. In both instances the opposite renal fossa, of course, is empty.

Stein, in 1916, in an exhaustive review of the literature was able to collect only 57 cases of unilateral fused kidney, to which he added 1 of his own, bringing the total number of cases up to 58.

[1] Supernumerary kidney, Jour. Amer. Med. Assoc., October 23, 1915, lxv, 1447 and 1448.

Since then, so far as I am aware, no extensive review of the literature has appeared. For the purpose of bringing the literature up to date, and also to induce others, who have seen similar cases, to report them, the following case under recent observation is reported.

The total number of cases which I have gathered from the literature for discussion number 28. Most of these have appeared since the publication of Stein's article, although a number were published prior to Stein's report but not included. These, with the case here reported, bring the total number of cases for discussion up to 29.

CASE HISTORY

Mr. M., aged twenty-eight. Admitted to United States Veterans' Hospital No. 76, Maywood, Illinois, August 3, 1922.

Previous illnesses. An attack of double pneumonia 2½ years prior to admission to the hospital.

Family history. Negative.

Present illness. Upon admission to the hospital complained of frequency of urination, of a growth in the right flank, dragging in the region of the lower back, nervousness, constipation, and weakness in the legs. The symptoms began in August, 1920, while on shipboard. Arose one morning feeling a severe soreness throughout the lower back, pain in the abdomen, and headache, after which constipation occurred. Two months later a tender growth was found in the right flank, which led to an operation, at which time the appendix was removed and the growth explored. He was told it was kidney. For nine months before entering the United States Veterans' Hospital he was treated for pyelitis, receiving weekly irrigations of his kidney pelvis with siliver nitrate.

Physical examination. Patient is well nourished and well developed. Tonsils cryptic; heart and lungs normal. Examination of abdomen: A large right rectus scar, the result of previous operation. On palpation a mass in the right lower quadrant of abdomen was felt, which appeared to be as large as a small grapefruit. The surface was slightly irregular, no tenderness on pressure.

Cystoscopic examination. Bladder and ureteral orifices negative.

Ureter. No difficulty or obstruction on catheterization; prompt flow of clear urine from each side.

Pyelograms. The right shadowgraph catheter at a point about at the level of the brim of the pelvis, passes outward and upward and stops at a level with the crest of the ilium. The left shadowgraph catheter passes upward and at the level of the pelvic brim passes across the median line and stops in the center of the right sacroiliac joint. The right pyelogram shows rotation of the pelvis toward the median line, with some dilatation and clubbing. The left pyelogram was triangular in outline and failed to show the minor calyces (incomplete filling?).

SEX

It is generally believed that renal malformations occur more often in the male than in the female, an opinion corroborated by the reported cases. In Stein's series, 47 cases occurred in males and only 17 were reported in females. In the series given here, 18 cases occurred in males, 6 in females, and in 5 the sex was not mentioned.

SIDE INVOLVED

Whether one side is involved more frequently than the other has no practical bearing on the clinical recognition or etiology. In this series, 16 cases were on the right side, and 10 on the left, and in 3 cases the side was not stated. As an aid in recognizing this condition the question of whether the lesion is right-sided or left-sided is of little moment.

AGE

From a review of the table of ages it would appear that patients suffering with this anomaly do not attain a very old age. The oldest patient reported, died at the age of sixty-five of pulmonary tuberculosis (Boody). Two cases were reported, (Huntington and Stewart) in which death occurred at the age of fifty-six. The table of ages is as follows:

	Number of cases
Under 1 year	4
1 to 10 years	3
11 to 20 years	1
21 to 30 years	9
31 to 40 years	3

41 to 50 years	2
51 to 60 years	2
61 to 70 years	1
Age not stated	4
Total	29

SOURCE OF CASES REPORTED

In this series of 29 cases, 12—less than one-half—were clinical cases, whereas the remainder, or 17, were autopsy reports. This would seem to argue against the statement made above as regards the clinical recognition of these cases. However, an analysis of this series shows that of these 12 cases, 11 were reported in the last five years.

CO-EXISTING RENAL PATHOLOGY

Notes on the pathology found in these kidneys, whether autopsied or clinical, are very interesting. Information on this point was available in 11 cases. Nephritis in one form or another was the lesion most frequently recorded. The following types were reported by five authors: Diffuse, subacute nephritis (Day) parenchymatous degeneration (Dennis); chronic diffuse nephritis (Felty); chronic interstitial nephritis (Gruner and Fraser); nephritis and arteriosclerosis (Carrieu and De Rouville). The next most frequently found lesion was stone, which was reported in 3 cases (Hyman, Lund and Rathbun). In 2 cases pyelitis was present or had been recently present (Lowsley, Kingery and Clark, and Kretschmer). In 1 case the records show that cysts were present throughout the entire kidney. In the remaining 13 cases no mention was made of other pathological changes. In 4 cases other congenital malformations were found, besides the fused kidney. In 2 cases the presence of a bifid pelvis was mentioned (Meyer and Wilcox). Rathbun's case is interesting in that a double pelvis and double ureter were present, which fused above the bladder so that only two ureteral openings were found upon cystoscopic examination. A case of abnormal insertion of one ureter, termination in the prostatic urethra, is mentioned by Carrieu and Rouville.

SURGICAL OPERATION

In the series given here surgical operations were reported by Bissell, Bugbee, Dennis, Hyman, Lund, and Lowsley, Kingery and Clark. In 3 cases operations were performed for the relief of stone (Human, Lund, and Rathbun). In the remainder of the cases, fixation operations were done. In 1 case (Stewart), a left inguinal colostomy was done for relief of obstruction of the bowel, due to carcinoma of the colon. Appendectomy was carried out in 3 cases (Bieberbach, Bissell, and Kretschmer).

SYMPTOMS AND SIGNS

The symptoms may be divided into three groups; (1) Those due to solitary fused kidney, (2) to coexisting renal pathology, and (3) to disease elsewhere.

Unfortunately, many of the autopsy cases are very briefly reported and no mention is made of the clinical side of the case. In the cases that come to autopsy early in life, symptoms due to fused kidney were probably absent and for this reason were not mentioned.

Pain

Pain is one of the most frequently mentioned symptoms. It may be due to several factors—the presence of the large renal mass or the presence of the coexisting lesions in the kidney such as stone or pyelitis. On account of various descriptive terms being used in reference to the pain, the type is not clearly defined, Thus, in this series of cases, one finds the following: Pain in the lower quadrant (Bierbach); discomfort in the right pelvis region and pain in the right leg (Bissell); dragging pain in the right side of the abdomen in one case, and bearing down pain on both sides of the lower abdomen in a second case (Bugbee); pain, tenderness, and nervousness (Dennis); pain in the left lumbar region, radiating to the umbilicus and posteriorly to the spine, in one case, and dull pain in the right lumbar region in a second case (Hyman); lumbar pain (Lund); pain in left groin (Rathbun). In cases in which calculi were found it is probable that the pain was due to the stone rather than due to the fused kidney.

Blood

This symptom was reported by three authors. Blood came from the urethra (Bierbach); hematuria during the attacks of pain (Hyman); hematuria (Lund).

Palpable tumor

The presence of a palpable tumor was reported by Bissell, Bugbee, Boody, Dennis, Hyman, Lowsley, Kretschmer, and Wilcox. Upon the first examination it may be difficult to establish the nature of the palpable mass; hence in this group of cases the problem of differential abdominal diagnosis comes up. Instead of a palpable abdominal tumor the protrusion of a mass into vagina has been found, and in this type of case the possibility of the fused kidney interfering with the normal delivery is self evident and requires no discussion.

DIAGNOSIS

In most cases the diagnosis from the routine physical examination is often fraught with much difficulty and hence not made. But the presence of this condition can be established by means of the shadowgraph catheters and pyelography. The ureters practically always terminate normally in the bladder, therefore plain cystoscopy is of no help. The roentgenogram, with the presence of shadowgraph catheters, is the best single aid in arriving at the correct diagnosis, when both catheters lead to the large mass on one or the other side of the body, with the exception of those rare cases in which the renal mass is found in the midline. Further convincing proof is obtained by the pyelograms (fig. 1), which often show the calyces pointing toward the median line. Failure to recognize this condition may lead to an unpleasant situation, as occurred in 1 case in which the entire mass was removed surgically and the patient died of anuria. In females, solitary fused kidney may be a causative factor of dystocia.

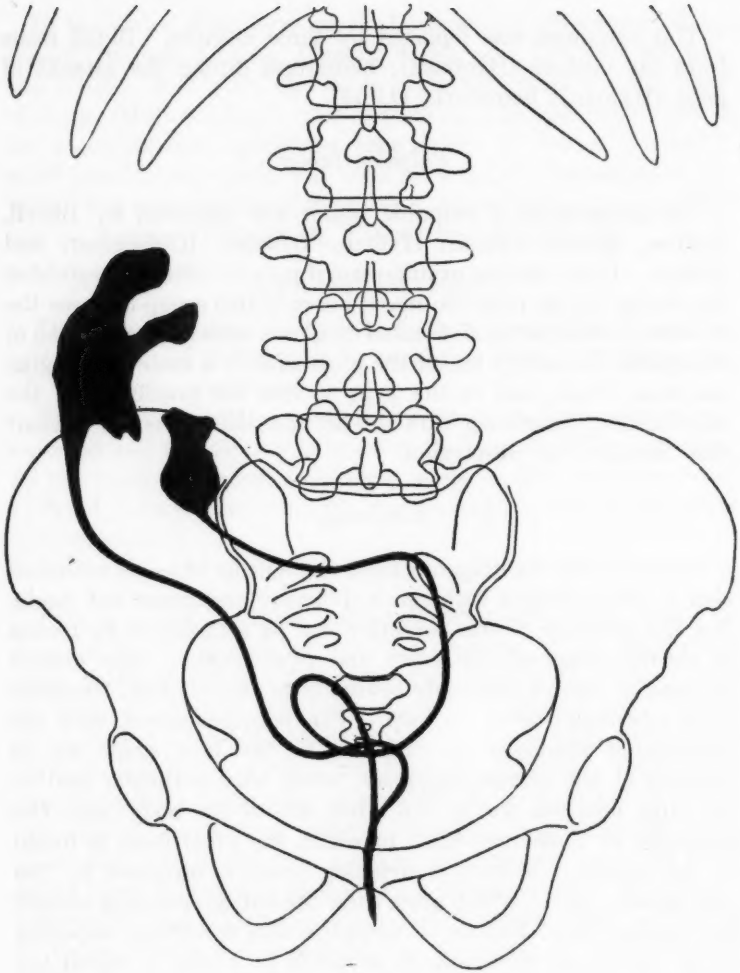

FIG. 1

GENITALIA

Although, in most of the articles published, no specific mention is made of this point, when reference occurs, to the genitalia they are recorded as normal. Thompson, however, reported the presence of hypospadias.

VASCULARIZATION

The vascular supply of fused kidney presents many abnormalities as evidenced in the cases reported, in which a careful study of this point was made.

In Carrieu and De Rouville's case the right renal artery came from the aorta and was the only aortic branch. The inferior blood supply came from the right to common iliac. In Pohlman's case the blood supply came from the aorta and right common iliac. Wilhelmj noted the following: "A single artery from the aorta going to the right kidney. The left kidney had two main arteries, one upper arising from the aorta. The lower one was broken off and its exact origin was not determined but probably came from one of three sources—the right or left common iliac or the inferior mesenteric." Meyer stated that all arteries that had not been cut arose from the right common iliac. And in Stewart's and Lodge's case there were four separate vessels springing from the aorta.

EMBRYOLOGY OF FUSED KIDNEY

According to Huntington the possibility for the occurrence of this form of congenital variation is at once suggested by the topographical conditions in the early embryonal stages of renal development. The principal etiological factor is, of course, the close apposition of the two renal buds in the early stages, when the terminal sprouts have become imbedded in the specialized renal blastema and the two organs are placed closely side by side in the indifferent prae-aortic mesodermal tissue, on the mesal aspect of the caudal poles of the mesonephroi. The main element of apposition and proximity, which affords the primary opportunity for the development of the fusion-variations in general, is further

influenced in some details by the typical conditions which obtain during the migration of the kidney.

Bieberbach. Male, aged twenty-seven. Grumbling pain above the umbilicus, which extended somewhat to the left side; increased by hard work; diminished by rest. Patient noticed blood from the urethra. Diagnosis, appendicitis; appendix removed. In the lower right quadrant, a movable mass, somewhat irregular; on gentle manipulation it moved upwards and downwards and to either side without producing any great discomfort. Urine, negative; Wassermann, negative. External genital organs, normal. Cystoscopic examination: Both ureteral orifices in normal position. Specimens of urine from each kidney: nothing of importance, negative to culture. Pyelogram: Presence of a solitary fused kidney.

Bissell. Female, aged twenty-two. From early childhood experienced much discomfort in the right pelvic region, pain in the right leg, and at times the entire right side from shoulder to foot gave much distress. An abdominal attack was diagnosed as appendicitis. Abdominal examination showed a large tumor filling the right pelvic region. Laparotomy: appendix removed, which showed positive evidence of a recent inflammatory invasion. Exploration of the tumor proved it to be a large fused kidney. Nephropexy. Cystoscopy and shadowgraph catheter done after operation: Bladder normal; both catheters passed to the right side of the abdomen.

Bugbee. Female, aged twenty-six; Italian; married. Complaint: Dragging pain low down on right side of abdomen. Both per vagina and abdominally a mass could be felt lying on the pelvic brim. Cystoscopic examination: Normal bladder. Right catheter passed 24 cm., left, 26 cm. Clear urine from each side. Roentgenogram: Both catheters passed to the right side of the abdomen and were arrested above the pelvic brim in the relative position of the palpable mass. At operation a fused kidney was reported lying above the pelvic brim.

Bugbee. Female, aged thirty-two; Italian; married. Four children by normal delivery. Chief complaint: Protrusion of a mass into the vagina; present for two years. Bearing-down pains on both sides of the lower abdomen, worse on exertion; chronic constipation. Vaginal

examination: The uterus pushed to the right side of the pelvis by a smooth, elongated, slightly tender mass on the left side. Cystoscopic examination: Both ureteral orifices in normal position. Right catheter passed 24 cm., left, 22 cm. Roentgenogram: Both catheters passed to the left side of the pelvis and were arrested, the right above the left, in the relative position of the pelvic mass. Urine from each catheter, negative. At operation a fused kidney was reported.

Boody. Male, aged sixty-five. Clinical diagnosis: Pulmonary tuberculosis. Small left adrenal. In left kidney area there was a supernumerary spleen, and on the right side, a double or fused kidney with two pelves and two ureters.

Carrieu and De Rouville. Male, aged fifty. Succumbed rapidly to phthisis. Only one renal organ present, in the form of a large embossed mass. This mass was heart-shaped and lay in an oblique direction extending from right to left over the vertebral column in the lumbar region. Only one large adrenal gland, which emptied into the neck of the bladder. Internal surface of the bladder showed that the trigonum had one orifice at the right upper angle; none at the left. Histologic structure of the kidney: Clean-cut traces of nephritis and arteriosclerosis.

Day. Male, aged seven. Well until two months prior to entering hospital, when he developed a non-productive cough, pain in chest, nausea and vomiting, swelling of ankles, and difficulty in breathing. Death occurred the day following admission to hospital. Necropsy findings: (1) Congenital absence of right kidney and right adrenal. (2) Left kidney had two separate pelves, each with a separate ureter. The ureters ran parallel to each other as far down as the fifth lumbar vertebra, where the one draining the cephalic pelvis turned obtusely to the right and entered the bladder at the normal position on right and the ureter draining the caudal pelvic entered bladder at normal position on the left. (3) Examination of the single kidney disclosed diffuse subacute nephritis. Marked hypertrophy of the heart, but no valvular lesion, ascites, hydrothorax or hydropericardium.

Dennis. Female, aged twenty-six. Large movable right kidney. Pain, tenderness, and nervousness. Nephropexy. Kidney fixed in position by Senn's method (first operation). Relief of symptoms

while urine escaped from side, but gradual return of all the symptoms after closure of wound. Kidney fluctuated in size. Cystoscopic examination: A little irritation about right ureteral orifice. Second operation: Nephrectomy six months after first operation. No more urine passed. Death seven days later. Examination of specimen: Adhesions about lower half had concealed second pelvis and ureter, and the lower portion represented the displaced and fused left kidney. No kidney in the left groin. Lower ureter crossed median line to the left side just below the promontory of the sacrum behind the rectum and in front of the vessels. It then followed along the left wall of the pelvis and opened into the bladder at the normal site.

Felty. Negro, aged forty-two. Cause of death: Chronic diffuse nephritis with cardiac decompensation. Blood Wassermann positive. Examination of retroperitoneal contents: A large single kidney, very slightly lobulated, lying in its fossa on the right of the vertebral column and projecting prominently into the abdominal cavity. No rudiments of renal tissue elsewhere in abdomen. Suprarenal capsules: Right, normal in position and shape; left, slightly lower than normal. Ureters: They emerged from a single large hilum; the upper passed almost vertically downward, crossing the right iliac vessels on its course into the pelvis; the other emerged from the lower part of the hilum, passed obliquely beneath the other duct, crossed the right iliac artery 4 cm. below its bifurcation and the iliac vein 1 centimeter below its junction, and thence crossed the vertebral column into the bladder. Bladder: Normal trigone with upper and lower ureters entering at the right and left orifices respectively. Seminal vesicles and vas deferentia: Normal.

Gruner and Fraser. Male, aged eighteen. Patient complained of cough, shortness of breath, abdominal pain. Death occurred a few hours after entering hospital. Post-mortem: Hypertrophied fatty heart, atheroma of aorta, chronic interstitial nephritis, edema of lungs, signs of hypostatic pneumonia, passive congestion of abdominal viscera. One kidney only; no other abnormality. Kidney: Size 25 by 8 by 4 cm. Normal position on the left side. A bend at lower pole where there was a prominence having the appearance and shape of an immature kidney implanted by its convexity upon the inner aspect of the normal left kidney near the lower pole of latter. Surface: A slight furrowing into lobes. On the anterior surface a sulcus running

longitudinally and consisting of a hilum directed forward and slightly downward. Ureter: From this longitudinal hilum arose an ureter with the pelvic end more bulky than usual. From implanted kidney another ureter in normal position for that kidney (the hilum directed toward spine). This ureter crossed behind the other but over the vessels to reach the opposite side of bladder. Both ureters entered bladder normally.

Gruner and Fraser. Male, aged thirty-six. Cause of death: Pneumonia. Right kidney: Definite right and left half; right half larger. Ureters from separate pelves, in each half of the viscus, and reached the bladder in the normal position. Two pairs of renal arteries: A larger pair passed in anteriorly; smaller pair entered the organ from behind. Only other abnormality: A patent foramen ovale.

Huntington. (Dissecting room specimen.) Male. The fused kidney was placed altogether on the left side. The lumbar region on the right side contained no trace either of renal substance or adrenal body. Left adrenal, normal. Ureters implanted normally into the trigone. Fusion evidently occurred between the caudal pole of the left and the cephalic pole of the right kidney, combined with a certain amount of lateral over-lap of the two renal buds producing in addition a marginal confluence and establishing a very complete union of the two fundaments into a single gross anatomical kidney with double ureters; each tract possessing a separate vesical orifice at the lateral angles of a typical trigone.

Huntington. (Dissecting room specimen.) Male, aged fifty-six. Unilateral fused kidney of the right side. Double ureters. Case was one of gross renal dystopia with fusion at the cephalic pole of the right uniting with the caudal pole of the left, combined with the umbilical veins of the abdominal vein trunks. The fusion was very complete and the resulting compound organ closely imitated in shape, position, and general appearance a normal large single right kidney with complete ureteric reduplication. The size, shape and position of the ureteric openings in the bladder were normal.

Hyman. Female, aged thirty-two. Dull pain in the right lumbar region for four years. Pain did not radiate but was aggravated when in the sitting posture. No urinary disturbances. The abdomen was

lax; no masses were palpable. Urine: Acid; specific gravity 1.018; trace of albumen; moderate epithelial cells. Cystoscopy: A normal bladder and trigone, with normally situated orifices. X-ray of the urinary tract: A suspicious shadow in the left lower quadrant of the pelvis. In order to determine its relation to the ureter, radiograms were taken with two opaque catheters in situ. These showed that the left ureter crossed the spine going towards the right kidney. Pyelogram (after injecting through both catheters): A fused right kidney, with two separate pelves. Nothing of a pathological nature besides this congenital anomaly could be determined, and the pain was probably due to pressure symptoms.

Hyman. Male, aged twenty-four. For two years had attacks of pain in the left lumbar region, radiating anteriorly to the umbilicus and posteriorly to the spine, which were accompanied by frequent urination and hematuria. On abdominal palpation a mass, round in contour and of a cystic consistence, was felt, extending from the left lumbar region, down to and below the umbilicus. Mass slightly mobile, and at times tender. Urine: Slightly cloudy; specific gravity 1.020; a moderate number of pus and red blood cells; a trace of albumen. Radiogram: A concentration the size of a cherry in the left lumbar region, close to the crest of the ilium, suggestive of an ureteral calculus. Cystoscopic examination: Normal bladder and trigone, and normally situated ureteral orifices. Both ureters were catheterized and no obstruction encountered. Shadowgraph catheter passed which showed the right ureter catheter crossing the spinal column, and coming in contact with the stone shadow, which was situated in the lower pelvis of a fused kidney. Diagnosis: A calculus in the lower pelvis of a fused kidney. Pyelotomy and removal of stone.

Kidd. Solitary kidney with double ureters, normally attached to the bladder. Autopsy specimen.

Lowsley, Kingery and Clarke. Male, aged twenty-eight. Pain in the right lumbar region of four years' duration, dull in character, radiating to right lower abdomen. Kidneys not palpable. Operated upon for a low right kidney with temporary relief. No hematuria, dysuria, nor frequency present. Cystoscopic examination: Normal bladder and normal ureteral orifices. Urine: Pus from left catheter. Pyelogram: Fused kidney on right side.

Lund. Russian, aged twenty-four. History of hematuria, dysuria, and lumbar pains of two years' duration. Cystoscopic examination: Bladder and ureteral orifices normal; both ureters allowed passage of catheters for 30 cm. While the right kidney showed normal secretion and no "indigo-carmin" in thirty minutes, the left kidney showed a decrease in the amount of urine and a fair "indigo-carmin" in fifteen minutes. Roentgenogram: Concretion in the pelvis of left kidney. Roentgen-ray examination, with shadow catheters: Catheters leaving the right and left orifices of the bladder normally, but at the right sacro-iliac synchondrosis the right catheter turned over toward the left, and close to the left transverse process of the fourth lumbar vertebra it stopped just laterally to the calculus. The catheter inserted in the left ureter continued up as far as the twelfth left rib. Roentgen-ray diagnosis: Fusion of the kidneys with a concretion in the lower pole of what appeared to be the pelvis of the right kidney. Operative findings: Enlarged kidney on the left side, representing a fusion of the left and the right kidneys; in the lower part a stone about the size of a small nut, which was easily released. Recovery was uneventful.

Mennacher. Case of fused kidney on the left side. This was found incidentally at autopsy in a five-year-old boy who had died of malignant lymphoma or pseudoleukemia. There had been no symptoms connected with the malformation. The right kidney was missing in its normal place, but was found on the left side under the left kidney, its upper pole apparently grown to the lower pole of the latter. There were two ureters, the right leading to the displaced right kidney, the left following the usual course to the upper left kidney. The two ureters crossed in such a way as to form an obtuse angle, the right lying behind the left. The length of the two fused kidneys together was 13 cm. On the anterior side they could be separated into three parts and the place of contact between the two kidneys was marked by a shallow groove. Both ureters proceeded in a straight course to the bladder, each entering the corresponding side in the normal way. The trigone, the prostate with its colliculus seminalis, and the other genitals were normal. Microscopic examination of the renal tissue: No pathological change. No anomaly could be ascertained in the suprarenal capsules.

Meyer. Specimen obtained at autopsy. Male, aged twenty-three. No clinical data. Two ureters, one of which was bifurcated near the renal mass. Weight of fused renal mass: 300 grams.

Pohlman. Male, negro, aged one year. Cause of death unknown, probably pneumonia. An irregular mass was found lying upon the bodies of the fourth and fifth lumbar vertebrae extending to either side. The tumor was, roughly, quadrilateral and flattened; the long axis obliquely directed so that it was higher on the right side. The ureters although they emerged ventrally, emptied in the normal position in the bladder.

Rathbun. Female, adult. Frequency and dysuria for two years; pain in left groin which had become worse. Cystoscopic examination: Ureteral orifices at usual locations and apparently normal. Catheter passed readily into kidney pelvis on the right; on the left it was arrested at a point near promontory of sacrum. Radiogram of injected left kidney: A somewhat dilated and tortuous ureter and dense shadow at point of obstruction. Diagnosis: Calculus. Operation: Left ureter found bifurcated at point over sacral promontory. The two ureters were traced for about $2\frac{1}{2}$ inches beyond the bifurcation, where they passed over to the right side and were definitely leading to the right kidney. Entire absence of the left kidney was conclusively demonstrated.

Stewart and Lodge. Male, aged fifty-six. Died of acute general peritonitis following left inguinal colostomy for annular carcinoma of the sigmoid flexure. Early metastatic deposits of growth both in the liver and in the abdominal (pre-aortic) and mediastinal lymph glands. Kidneys: No renal tissue on the left side of the body. *Although the left adrenal was normally situated.* The right kidney was apparently enlarged, measuring 16.5 by 7.5 by 4 cm. in its three diameters. Attached to and closely incorporated with the inner aspect of its lower half was an accessory kidney, measuring 9 cm. in length, and about 3.5 cm. in width. This distinctly demarcated mass would seem to represent the left kidney, and even so, the two organs appeared to be fused over a wide area. Each had a separate hilum, pelvis, and ureter. Ureters: The right ureter sprang from the upper hilum, at the level of the first lumbar vertebra, this pelvis having one vein anterior to it and an artery and vein behind. The left sprang from the lower hilum, and at first ran almost directly downward in a deep groove in the anterior surface of the kidney. It then passed downward and inward across the right psoas magnus muscle, afterwards beneath the right ureter, and finally crossed the middle line just below the bifur-

cation of the aorta. Bladder: The orifices of the ureters and plicae uretericae appeared normal.

Sutherland and Edington. Male, infant, aged two months. Cause of death: Acute bronchopneumonia. Post-mortem: Fusion of kidneys; hypospadias; small umbilical hernial sac. Fused kidney occupied the left side. No kidney on the right side. Kidney mass, 6.5 by 3 by 2.5 cm. Anterior surface distinct lobulation. Posterior side smooth. Hilum faced anteriorly. Two distinct pelves emerged from hilum, one above the other. Two ureters: The lower to the right side of the trigone; crossed anteriorly by the upper ureter which passed to the left of the trigone. Suprarenal capsules, normal. Vasa deferentia, vesiculi seminales, testes, normal. Fairly well marked hypospadias.

Thompson. Male, aged six weeks. A lobulated left solitary kidney, extended as low as the bifurcation of the aorta. Three segmental vessels passed to the kidney from the left side of the aorta. Two ureters: One from the front and upper part, extended downward in front of the organ to the pelvis, the other passed from the lower and narrow end of the kidney. The upper one passed to the bladder and opened into it in the usual position of the left ureter, the lower one cut across the bifurcation of the aorta and lay superficial to that vessel. Passing into the pelvis, it opened into the bladder in the position of the right ureter.

Wilcox. Male, aged ten months. Admitted to hospital suffering from an acute infection of the pharynx, cervical adenitis, and otitis media. Temperature 105. An indefinite mass was palpated in the lower right quadrant. The kidneys were represented by an irregular nodular mass in the midline at the level of the brim of the pelvis. Numerous cysts were present throughout the kidney substance. The renal mass consisted of three kidney elements fused together.

Wilhelmj. The left kidney was displaced to the right side and lay inferior to the right kidney. The right kidney was abnormally low, its lower pole overlapping the crest of the ilium and extending about 2.5 cm. below it. The right suprarenal had its normal relation to the upper pole of the right kidney; the left was normally placed and was on about the same level as the right. Ureter from displaced left kidney: Perfectly normal entrance into the bladder on the left side. The trigone of the bladder was also normal.

Winternitz. Aged five months. Death from acute and chronic ulcerative enteritis and colitis. Autopsy: The two kidneys were fused and formed an s-shaped mass. Two distinct kidney-shaped poles; each with a definite hilum. Ureters: That of superior pole normal as it entered the hilum. Inferior (lower mass) calyx bulged and dilated into a heart-shaped structure, 1 centimeter in diameter. Both ureters entered the bladder in the normal position. Blood: Two renal arteries; two renal veins.

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PAPILLARY CYST-ADENOMA OF THE KIDNEY ASSOCIATED WITH PAPILLOMATOUS GROWTHS IN THE PELVIS, URETER, AND BLADDER

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Recent articles in the American and continental literature, and more particularly that of Scholl, with its comprehensive treatment of the whole subject, and a complete bibliography, might appear to render superfluous a further communication on the subject of papillary tumors of the renal pelvis. Of 2 such cases coming to our attention in the last five years, the following case, which in many respects exhibits no new feature in the symptomatology, diagnosis, treatment and subsequent course of such tumors, in other respects, seems unusual enough to merit a special report.

Case report. G. F., Montreal General Hospital, No. 5160, 1921, waiter, male, married, aged sixty-eight. Admitted November 8, 1921.

For the past four months he has noticed hematuria, spontaneous, intermittent and painless. The first blood that appeared came on at night, after he had been digging in his garden, and lasted for two days. Subsequently, there has been blood about every two weeks. He has had nocturnal frequency of micturition for about seven months, and the stream was slightly delayed and weakened at night.

His general physical condition was good. By rectum the prostate was slightly enlarged. There was no residual urine. Cystoscopy showed a trabeculated bladder, with lateral and median prostatic salients, the latter projecting over the interureteric ridge, and rendering view of the ureters difficult. Ureters showed normal spurts. Catheterized, the right ureter showed a few leucocytes, the left a few red blood cells. Bleeding from the prostatic urethera was free. The common catheter specimen contained no blood cells. The few red blood cells from the left kidney were regarded as traumatic in origin.

X-rays were negative for calculus. The renal function was normal. A prostatectomy was advised and carried out in two stages, November 17 and 25, without incident. The pathologist reported benign adenoma and chronic prostatitis. During his stay in hospital the urine at no time showed any blood. He left the hospital on December 24, 1921. Almost immediately after leaving the hospital, he noticed blood in the urine. This persisted. Cystoscopic examination was made on January 9, 1922, two months after the last examination. The bladder was normal except for moderate trabeculation. No prostatic obstruction was now apparent. The ureters were now easily discernible and a blood spurt was seen coming from the left orifice. Both ureters were catheterized. Clear urine was obtained from the right and frankly blood-stained urine from the left.

	COMMON	RIGHT	LEFT
Color	Bloody	Clear	Bloody
Reaction	Acid	Acid	Acid
Albumin	+	0	+
Sugar	0	−	−
Urea	−	1.2 per cent	0.4 per cent
Microscopic red blood cells	+++	Few	+++
Cultures	−	Negative	Negative

Pyelograms were taken. Thorium, 6 cc. on right, 10 cc. on left, was injected without pain. These pyelograms were not satisfactory. The patient was readmitted to hospital on January 12, 1922, and the pyelograms were repeated on January 13, 9 cc. thorium being injected on each side. At this cystoscopy a blood stained spurt was observed coming from the left ureteral orifice. Specimens were taken from each ureter for urinalysis.

	COMMON	RIGHT	LEFT
Color	Bloody	Clear	Bloody
Reaction	Acid	Acid	Acid
Albumin	0	0	0
Urea	−	1.2 per cent	0.4 per cent
Red blood cells	Many	Few	Many
White blood cells	Few	0	Few

Pyelograms were taken, thorium being used, 6 cc. on the right side and 10 cc. on the left side. That of the right side showed no special

feature. The one of the left side, however, showed the kidney to be markedly irregular, with broad calices and several filling defects about

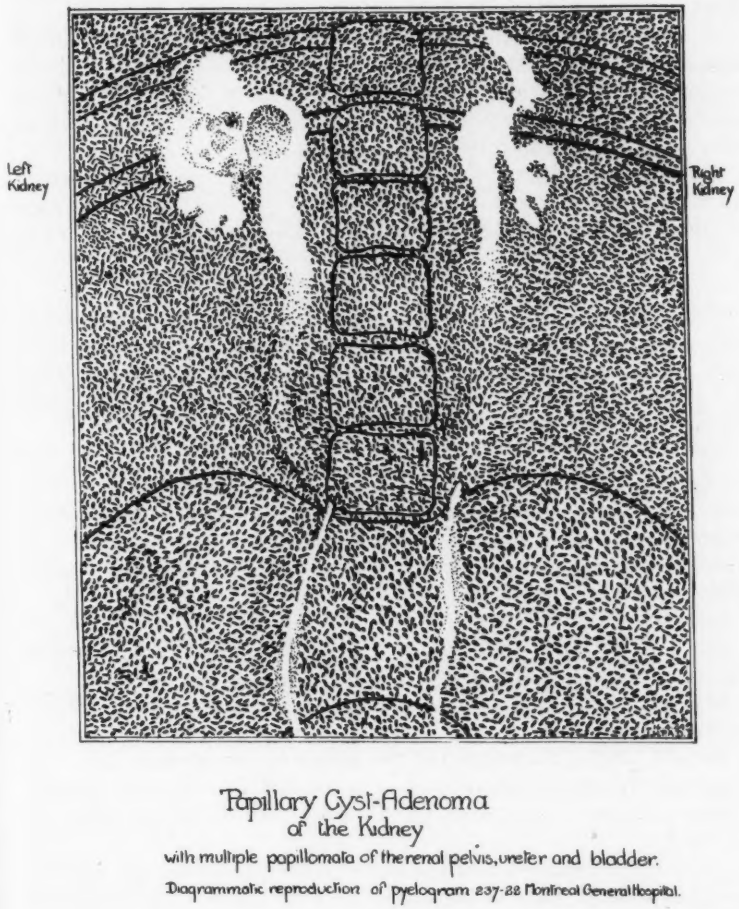
Left Kidney
Right Kidney
Papillary Cyst-Adenoma
of the Kidney
with multiple papillomata of the renal pelvis, ureter and bladder.
Diagrammatic reproduction of pyelogram 237-28 Montreal General Hospital.

FIG. 1. DIAGRAMMATIC REPRODUCTION OF PYELOGRAM

2.5 cm. across, the most marked of which was situated in the pelvis. The calyx immediately above this was broad and distended.

A tentative diagnosis of tumor of the renal pelvis was made. This was based upon the character of the hematuria, the filling defects in the pelvis, with evidences of partial hydronephrosis above the defects, as shown in the pyelogram.

A lumbar nephrectomy was performed uuder general anesthesia on January 18, 1922. At the operation the pelvis was distended by a boggy, resistant material which extended down as far as the ureteropelvic junction. The ureter was sectioned below this point. Palpation of it below this point revealed no abnormality.

On February 9, 1922, the entire left ureter was removed, through an anterior oblique extraperitoneal incision. This was done because of the known tendency of such tumors to propagate themselves in the lower urinary tract, by transplantation.

Convalescence was uneventful.

Subsequent course: The patient was warned to return for regular cystoscopic examination in view of the danger of the development of papillomata in the bladder. This he did not do until July 29, 1922, five months after his operation, when he noticed that his urine contained blood and blood clots.

Cystoscopy, July 31, 1922, revealed four minute papillomata, two on the brim of a saccule in the midline just behind the interureteric ridge, and two on the upper aspect of the sphincter. These were fulgurated.

August 29, 1923, no bleeding since noticed. Cystoscopy revealed three papillomata on bladder floor. These were fulgurated.

September 29, 1923. Cystoscopy. No signs of papillomata.

January 8, 1923. Cystoscopy. One papilloma left postero-lateral aspect of bladder, fulgurated.

May 17, 1923. Cystoscopy. Fulguration of one tumor behind the interureteric ridge.

May 31, 1923. Fulguration of the above tumor repeated.

October 9, 1923. Patient had been warned to return at regular intervals, but he did not do so till this date, when he noticed blood in his urine.

Cystoscopy revealed two larger raspberry-like papillomata behind the interureteric ridge, and two smaller ones on the upper rim of sphincter. Fulguration.

October 25, 1923. Fulguration repeated.

November 15, 1923. Four papillomata at vault of bladder. Fulgurated.

November 30, 1923. Bladder clearer. Three small tumors, overlooked probably at the last examination situated just above the rim of the sphincter and partially hidden by it.

February 9, 1924. Cystoscopic examination. Two small papillomata in bladder vault were fulgurated.

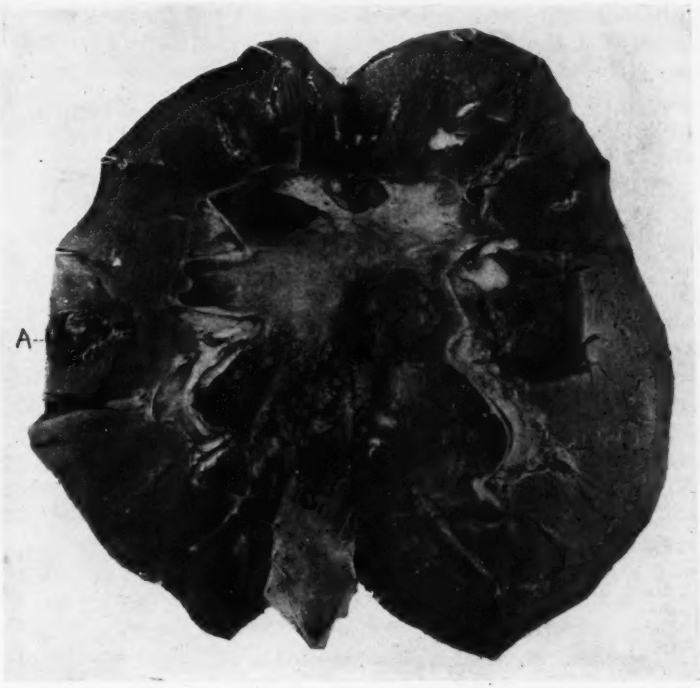

FIG. 2. PHOTOGRAPH OF FRESH SPECIMEN: (*a*) CORTICAL TUMOR; (*b*) PAPILLOMATA OF RENAL PELVIS; (*c*) PAPILLOMATA OF URETER

April 17, 1924. Cystoscopic examination. A small papilloma at bladder vault, and a larger one on the interureteric ridge were fulgurated.

Pathological report. S-22-45. Gross description: "The specimen consists of the left kidney which weighs 128 grams, with 6 cm. of ureter attached. The capsule of the kidney is everywhere intact. About

the middle portion of the superior surface there is a slightly depressed area 1.5 cm. in diameter, in the central portion of which the capsule is slightly elevated. This area is bluish black in color. On palpation no masses can be felt within the kidney. The blood vessels are normal in their anatomical relations. There is no increase in the perirenal fat. The ureter is roughly conical in shape. It is widest at its junction with the pelvis where it is 1.5 cm. in diameter and gradually decreases in size until at its lower extremity it is normal in width. Shining through the dilated portion of the ureter numerous small yellowish

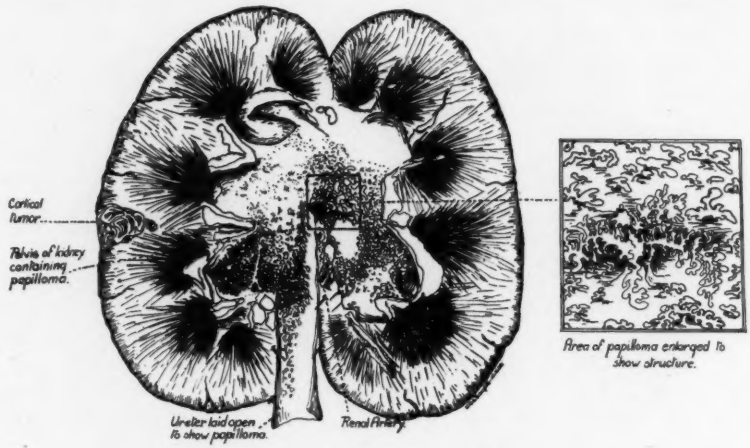
Cortical tumor
Pelvis of kidney containing papilloma.
Area of papilloma enlarged to show structure.
Ureter laid open to show papilloma.
Renal Artery
Papillary Cyst-Adenoma of the Kidney
with multiple papillomata of the renal pelvis and ureter.
Montreal General Hospital 0 32446.
Service of Dr F S Patch.

FIG. 3. DIAGRAMMATIC REPRODUCTION OF FRESH SPECIMEN

points are seen. On palpation of the ureter there is felt throughout the dilated portion a soft tissue which moves between the fingers. The pelvis cannot be satisfactorily palpated on account of attached peri-renal fat. The kidney, pelvis and ureter are incised, leaving the entire organ as an anatomical unit. The incision through the kidney passes through the middle portion of the bluish discolored area described above. This discoloration is due to a small collection of blood just beneath the capsule. Immediately beneath it there is a sharply outlined area which measures 2.5 by 2 cm. in its greatest diameter.

This area is roughly oval in shape with its apex pointing downwards and extends from the extreme margin of the cortex downwards into the kidney substance, but at its greatest depth reaches only to within 2 cm. of the pelvis. The area is not of a uniform color. It has a reddish tinge along one margin and in its superior portion. The remainder of the mass is pale grey in color with small bluish black areas of discoloration. The mass is a little softer than the surrounding tissue. While it is sharply demarcated from the surrounding tissue it cannot be enucleated.

"The pelvis and the calices of the kidney are moderately dilated. Throughout the lower two-thirds of the pelvis and extending into the ureter for a distance of 4 cm. there is a diffusely distributed papillary growth. This papillary growth at its upper margin is irregular in outline. Below this point the pelvis is extensively involved and the growth extends into the calices which in this region are more widely dilated than elsewhere. The size of the individual growths varies. The largest, which is situated near the upper margin of the portion of the pelvis of kidney which is involved is 2 cm. in diameter. This mass appears as a globular-like growth which is made up of a great number of individual papillae, and is attached to the pelvis by a delicate pedicle, 3 mm. in diameter. The attachment is very fragile and was broken while the specimen was being washed in Ringer's solution. The remainder of the tumor is of a similar character. The individual papillae are delicate and when the specimen is placed in salt solution and viewed with a hand lens, they are almost innumerable. The smallest ones are just visible. The tumor described in the pelvis continues without loss of continuity down into the ureter for a distance of 4 cm. but the individual tumor masses are comparatively small. The amount of tumor in the ureter rapidly decreases in amount to a point 4 cm. below its orifice where no tumor masses are visible with a hand lens. The wall of the pelvis of kidney and ureter do not appear to have been infiltrated by the growth which is present on their mucous surfaces. The left ureter below the area involved by tumor is neither dilated nor thickened. The mucous membrane is everywhere intact. No lesions are found when examined with a hand lens.

"*Histological report.* The material upon which the following report is based was obtained from the specimen immediately after operation and placed in fixing fluid at once. Blocks of tissue were taken from various places in the pelvis, through the entire thickness of the kidney substance at different levels and half of the cortical tumor was pre-

served. Sections were also taken from various places in the ureter. Serial sections were made of half of the cortical tumor. The blocks of tissue were embedded in paraffin and the sections have been stained with various differential stains.

"*Cortical tumor.* The section includes the entire thickness of the kidney substance, embedded in which is the tumor. Without any magnification a sharply outlined mass is seen in the cortex. This

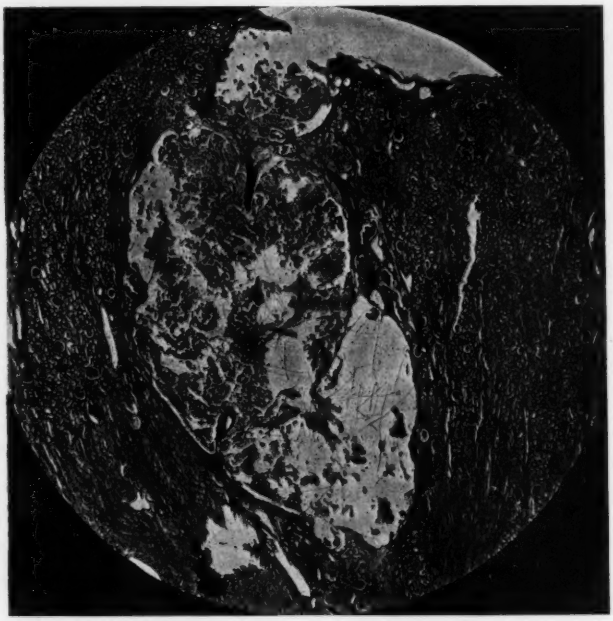

FIG. 4. SECTION OF CORTEX OF KIDNEY INCLUDING THE TUMOR. × 10 DIAMETERS

area is elongated and extends from the capsule to about the mid portion of the kidney substance. It is not as dense as the surrounding kidney tissue. In places there are small masses which stain yellowish red with haemotoxylin and bluish black with phospho-tungstic acid hemotoxylin. Under the microscope the tumor is, for the most part, sharply separated from the surrounding kidney tissue by a band of rather dense connective tissue, which in some places shows the remains of

kidney tissue. There are areas however, where tumor cells are in close relationship to kidney tubules. The tumor itself is, for the most part, composed of pale staining epithelial cells, the nuclei of which stand out sharply. These cells generally occur in large and small masses without any pronounced architectural arrangement. There are places, however, where they have a papillary character. The extreme border of the tumor is in places lined with a narrow border of epithelial cells which are not so pale, and their nuclei stain deeper than the cells which make up the bulk of the tumor. Some of the

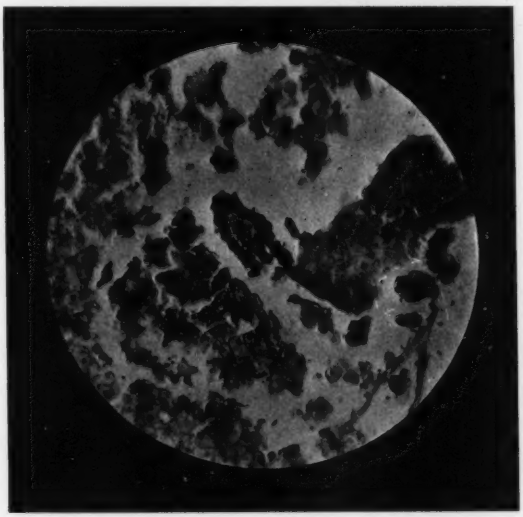

FIG. 5. DETACHED PAPILLA WITHIN CORTICAL TUMOR MASS. × 140 DIAMETERS

masses of cells at the margin of the tumor show this same cystic-like character. While in places groups of tumor cells are in intimate relation to kidney tissue, we have been unable to demonstrate with assurance the presence of tumor cells within a kidney tubule. Serial sections from the tumor area have been carefully examined with this point in view. In some places, the tumor shows degeneration and small areas of haemorrhage. The tumor has a rich blood supply and the vessel walls are thin. Mitotic figures are present in tumor cells though they are not abundant. There is occasionally found within the tumor an attempt at gland formation.

"*Diagnosis.* Papillary adeno-cystoma of the kidney of a comparatively low degree of malignancy.

"Sections of the kidney outside the tumor area. No tumor cells have been demonstrated in these sections. The arteries show a moderate degree of arteriosclerosis and there are here and there sclerosed glomeruli. There are a few small areas which show scar formation and infiltration with lymphocytes.

FIG. 6. GROUP OF TUMOR CELLS AT MARGIN OF KIDNEY TUMOR, IN CLOSE RELATION TO KIDNEY TUBULES

"*Pelvis of the kidney.* Sections from the kidney pelvis, without magnification shows small papillary-like projections. Microscopically there are large and small papillomata which project into the pelvic cavity. They are lined with elongated epithelial cells which in places are several layers thick. The stems of the papillae are composed of connective tissue which has a rich blood supply. Within this connective tissue stem, there are in places groups of tumor cells. Similar groups of cells are seen in the submucous connective tissue, opposite the papillae. There is a moderate degree of infiltration of the sub-

mucosa with lymphocytes. As in the main tumor, mitotic figures are comparatively rare.

"Diagnosis: Papilloma of the kidney pelvis of a comparatively low degree of malignancy; chronic inflammation of the pelvis.

"*Sections from the ureter.* The first part of the ureter shows a papillary growth similar to that described in the pelvis. Sections have been made from various places in the ureter beyond the area of gross involvement. The mucosa is intact. There is no inflammatory reac-

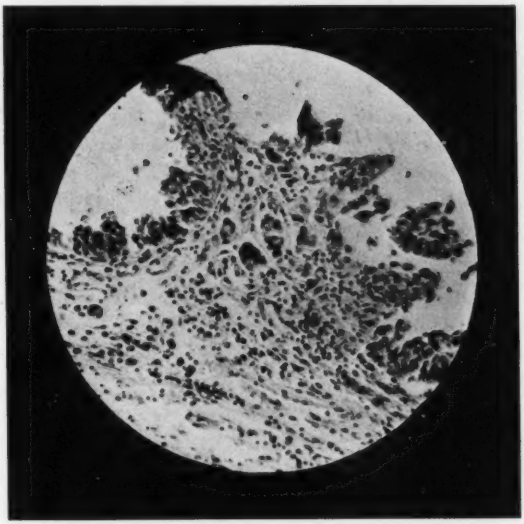

FIG. 7. TUMOR CELLS WITHIN THE STEM OF A PAPILLOMA OF KIDNEY PELVIS. ×140 DIAMETERS

tion in the sub-mucosa and there is no hypertrophy of the musculature. One of the sections taken from the constriction at the brim of the pelvis shows within its lumen a small mass of cells, similar to those which line the papillomata of the pelvis of the kidney. We have been unable to demonstrate actual attachment of these cells to the ureteral mucosa.

"Diagnosis: Multiple papillomata of first part of the ureter. The tumor is of a comparatively low degree of malignancy."

DISCUSSION

The question arises as to the relation between the tumor in the cortex of the kidney and the papillomata in the pelvis and ureter. Those in the bladder are obviously transplanted from above. Four possibilities have to be considered.

1. There are two distinct primary tumors, a papillary cyst-adenoma in the renal cortex, and papillomata in the pelvis.

2. The renal tumors are metastases from tumors elsewhere in the body.

3. The cortical tumor is a metastasis from papillomata, primary in the renal pelvis.

4. The papillomata are metastases from the cortical tumor.

A difficulty arises from the fact that the two tumors are not histologically absolutely identical, the cortical tumor being a papillary cyst-adenoma and the pelvic ones villous papillomata. If it could be proven that the latter were metastases of the former the change in the character of the cell growth under a different environment would not be difficult of explanation. There exist analogies for such transformation in other parts of the body. It is well known that papillary cyst-adenomata of the ovary are only too readily transplanted throughout the abdominal cavity, where they assume a papillomatous form and on the free surfaces of the peritoneum produce a veritable papillomatosis. In our case, a most meticulous search of serial sections was made by one of us to prove a continuity of the cortical tumor along the renal tubules to the pelvis. This continuity could not be demonstrated. There is no continuity between the papillomata of the renal pelvis and the transplants from them in the ureter and bladder. The cortical tumor, for the most part encapsulated, shows at more than one point a breaking through its capsule and is in microscopical proximity to kidney tubules. Furthermore, it may be noted that the densest growth in the pelvis is opposite the papillae, which drain that portion of the cortex in which the cortical tumor is situated; massed at a point upon which the urine flowing from that area in the cortex would most naturally impinge. Once implanted on the pelvic mucosa subsequent transplantation

in the pelvis, ureter and bladder would be without impediment. The relative differences in size of the cortical tumor and the pelvic tumor may be readily accounted for by the encapsulation of the former, and the relatively unhampered possibilities of growth possessed by the latter. The growth of the one would be slow, whereas the latter would grow and reproduce itself rapidly, as our observations of the rapid development between fulgurations of the vesical papillomata have proved. The possibility of the renal tumors being metastases from tumors situated elsewhere in the body, lacks both probability and proof. In the absence of any other evidence of metastases in the body, a solitary metastasis of a primary pelvic tumor in the renal cortex appears most improbable. Similarly, the suggestion, made in a personal communication by Kretschmer, of a retrograde extension of a primary pelvic tumor along the kidney tubule appears to us to be less reasonable than the reverse course, which we are inclined to believe is the one which has taken place. The existence, however, of two primary tumors has much probability in its favor and cannot be easily controverted.

While one frequently sees papillary cyst-adenoma breaking through into the renal pelvis as such, we have not been able to find any reference to a case resembling the one here reported. Kretschmer reports 11 cases of papillary cyst-adenoma of the kidney with metastases. In his case, the pelvis was "free from any tumor growth." He states that Dunn was "able to demonstrate with microscopic sections a communication between the cysts and the convoluted tubules."

The tendency of papillomata to transplant themselves down the urinary current is well known. In this case the presence of a mass of cells, presumably papillomatous, was noted in the ureter at the pelvic brim. These cells had probably been detached from the tumor in the manipulation of the kidney at the time of operation. With such fragile growths, such detachment by muscular movements or trauma is not difficult, and accounts for their extreme prolificness. They have a marked tendency to transform themselves into malignant tumors. This potential malignancy has been noted by many clinicians, even where a definite malig-

nancy is not confirmed histologically. Scholl goes further, and asserts that "if a careful histological study is made of sections from various parts of the growth, small circumscribed areas of malignancy will almost invariably be found, even in the small pedunculated, grossly benign papillomata." In our case, careful search revealed a malignant infiltration, not only in the case of the cortical tumor, which was not unexpected, but also in the more benignly appearing papillomata.

CONCOMITANT LESIONS

Of interest is the not unusual production of a moderate partial hydro- or hemato-nephrosis proximal to the pelvic tumors. In the other case we have referred to, an extensive malignant papillomatosis of the bladder had blocked the left ureteral orifice and prevented catheterization of that ureter. The patient was examined shortly before his death, and the autopsy revealed a ureter and kidney greatly dilated, the kidney being transformed into a mere sac. On the wall of its pelvis there was a malignant papilloma, which was regarded as either a primary tumor from which vesical transplantation had taken place, or as a metastasis or a transplant by ureteral reflux of a primary vesical tumor.

In the case which we are reporting there were also noted areas of chronic cortical sclerosing nephritis, and the cortical tumor had developed in one of these areas, represented by a depression on the outer surface of the kidney. Similar areas were noted elsewhere in the kidney. The submucous tissues of the pelvis showed infiltrations with small lymphocytes. Whether any etiological significance in the production of the tumors is to be ascribed to these areas of inflammation, is open to question, though in the case of the pelvic lesions, they may be just as reasonably regarded as secondary to the papillomata.

CLINICAL CONSIDERATIONS

In this case, the hematuria was not marked. Its spontaneous, painless, and intermittent character was not unlike similar reported cases, though less profuse than most, considering the ex-

treme vascularity of these tumors. The importance, nay the necessity of submitting any case showing hematuria to a complete urological examination is apparent. Where there is no tumor of the bladder, pyelography is of the greatest aid. At the first examination of our patient, hematuria was not present, and the presence of an enlarged prostate led us to ascribe an undue importance to it as the possible cause of the hematuria. It was only when it recurred after the prostatectomy, that the pyelograms were made, and the true condition revealed. The possibilities of vesical papillomata being transplants from tumors higher up in the urinary tract should direct greater suspicion to them. When they are present, the advice of Thomas to make a complete urological examination, including bilateral pyelography, is worthy of being made a routine practice.

There should be no need to insist on the necessity of a complete resection of the ureter, in addition to the nephrectomy. Legueu points out that the most prolonged survivals are in patients where this procedure has been followed, and reiterates the precept of Albarran to this effect. In a number of reported cases, the extirpation of the ureter was only to the bladder, and a similar error was made in our case, though there is no evidence that the remaining vesical portion of the ureter is the site of metastases. Resection of the ureter should include a resection of the ureteral orifice, as Scholl expressly advises. Even with this radical procedure, recurrences in the bladder may be expected. Repeated cystoscopic examinations makes possible their early recognition and permits of appropriate treatment, when they are most easily dealt with.

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MALIGNANT PAPILLOMA OF THE KIDNEY PELVIS

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In October, 1922, a woman, aged sixty-one, entered the Surgical Service, Massachusetts General Hospital, complaining of hematuria and pollakiuria.

Family history. Negative.

Past history. Negative except for attacks of vertigo for past twenty-one years, and blurring of vision for the past six years. Glasses corrected these symptoms. Normal menstrual history. Menopause nine years ago.

Present illness. Nine years ago, patient fell and sustained a slight injury to back. No symptoms resulted from this except an immediate soreness and stiffness of back. Five years ago, patient developed her first attack of painless hematuria. Since then she has had intermittent attacks, usually moderate in amount. Cloudy urine between attacks. Gradual development of nocturia 1 to 5 times; normal by day. Slight dysuria. First attack of pain four to five weeks ago, second one week ago.

Physical examination. Well developed adult female, aged sixty-one years, well nourished, good muscular tone. Cryptic tonsils. Chest negative. Abdomen negative; organs not palpable, no areas of pain or tenderness. Extremities normal. Reflexes normal. Vaginal examination negative. Rectum negative except for small hemorrhoids.

Blood. Red count 5,968,000. White 9800. Hemoglobin 80 per cent. Blood pressure 160/95.

Urine (catheter specimen). Pale, acid, specific gravity 1.014, albumin slight trace, no sugar. Sediment—many white blood cells, few red blood cells, motile bacilli, no casts.

Cystocopy. October 13, 1922. Bladder mucosa reddened. Scattered over base of bladder are a group of perhaps fifteen small papillomatous nodules one of which is at the orifice of the right ureter.

Divided function. Right—2.5 per cent for fifteen minutes. Left —8.5 per cent for fifteen minutes.

X-ray report. October 13, 1922. Two very faint shadows in the region of the right kidney pelvis, not character of stone, might be in

FIG. 1. X-RAY OF REPORTED CASE, SHOWING RENAL SHADOW INTERPRETED AS STONE

the gall bladder region or kidney, or dense material in the bowel. On the other plate are seen two small shadows near the tip of the third right transverse process not seen on the first plate examined. Another of the same character on the left side of the pelvis which seems outside of the course of the ureter. These are more suggestive of artifacts than pathological abnormalities. Small area of increased density on the external border of the right sacro-iliac line suggests a small area of density in the bone (fig. 1).

October 14, 1922. There is a small round shadow, with fairly sharply defined border, about 1 cm. in diameter which lies in the course of the ureter between the transverse process of the second and third lumbar vertebrae. This shadow is constant in all plates taken. It is not obliterated by the opaque mixture. Filling of the pelvis is incomplete: No evidence of pathological change in the lungs (fig. 2).

Operation was done on the Surgical Service October 26, 1922. Apparently no attention was paid to the cystoscopist's report of tumors in the bladder.

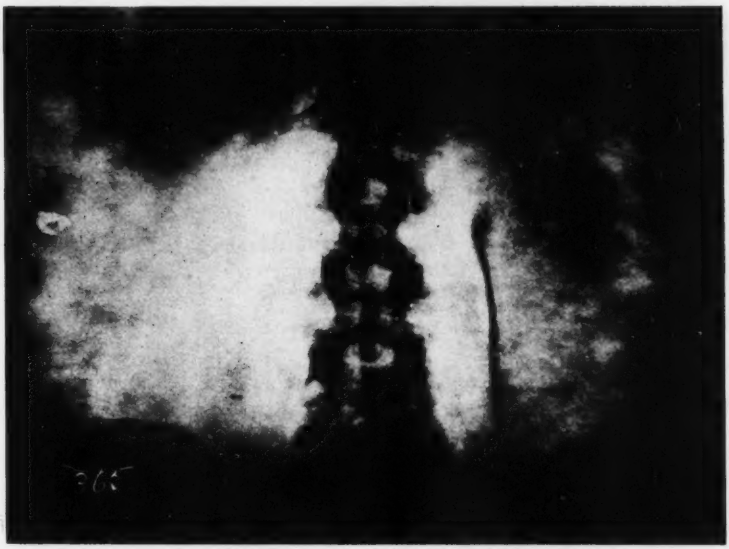

FIG. 2. PYELOGRAM OF REPORTED CASE, SHOWING BLURRING OF LOWER CALICES

Preoperative diagnosis. Stone.

Postoperative diagnosis. Cancer of kidney originating from renal pelvis.

Operation. No stone found. Lower two-thirds of kidney thickened and hard. Nephrectomy.

Microscopic. Primary carcinoma of the renal pelvis.

Uneventful convalescence.

Discharged December 10, 1922, and had no urinary symptoms until July 4, 1923, except for slight frequency 1 to 2 times at night and two

to three hours by day. Developed hematuria on above date and had it intermittently until re-entrance July 19, 1923, to Genito-Urinary Service.

Physical examination. Same as above. X-ray of pelvis and lumbar vertebrae negative for metastases.

July 20, 1923. Blood count: white blood cells 7500; red blood cells 5,296,000. Hemoglobin 80 per cent. Phenolsulphonephthalein .55 per cent for two hours. Non-protein nitrogen 40.2 per cent.

Microscopic. Many white blood cells.

Cystoscopy. July 20, 1923. Two solid looking tumors, with small pedicles, at base of bladder. Right ureter can be seen projecting into bladder as if it were full of something. Out of ureter projects a small tumor.

July 23, 1923. X-ray shows no evidence of pathology in the bones of the pelvis or lumbar spine. Lower dorsal is well shown on plate.

Operation. July 24, 1923. Median suprapubic incision. Peritoneum stripped upwards and inwards. Ureter identified and found to be smooth and size of thumb. Ureter freed by blunt dissection until upper end was loosened. Bladder opened about 1 inch from entrance of ureter and the incision carried around ureteral orifice with a radius of 2 cm. Ureter and surrounding bladder wall removed. Two small superficial papillomata in base of bladder cauterized.

Convalescence uneventful.

Pathological examination of ureteral tumors (fig. 3) showed benign papillomata.

Returned November 13, 1923. Cystoscopy negative. Urine shows 5 to 10 pus cells per high power. Gaining in weight. Complains of arthritic pain in back, chest, and extremities.

Examination negative. Skeletal system X-rayed and showed no evidence of metastases.

Patient was given four treatments with deep X-ray over region of right kidney and lumbar spine as follows:

DATE	NUMBER	MA. MINUTES	FILTER	K.V.	DISTANCE	SPARK	LOCATION
1923							
November 14	1	200	A_4L	80	16″	8″	Right lumbar (anterior)
November 16	2	210	A_4L	80	16″	8″	Right lumbar (posterior)
November 18	3	210	A_4L	80	16″	8″	Right lower back
December 7	4	210	A_4L	80	16″	8″	Right abdomen

May 21, 1924. Examination of patient shows no evidence of recurrence. There is a hernia in suprapubic scar. The urine is normal. Cystoscopy shows no recurrence of tumor in bladder.

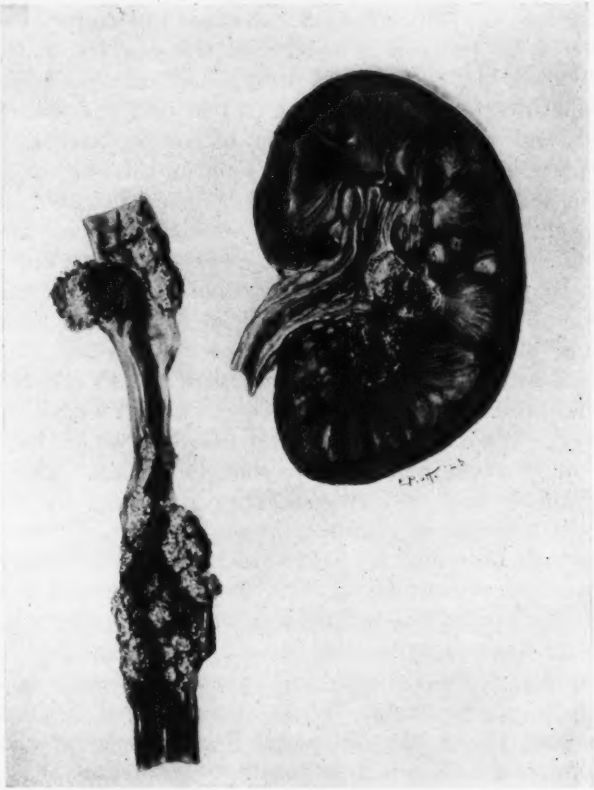

FIG. 3. DRAWING OF KIDNEY AND URETER OF REPORTED CASE, SHOWING PAPILLARY CARCINOMA OF KIDNEY AND APPARENTLY BENIGN TRANSPLANTS IN URETER

The fact that this was the first case of this type with which we had had experience induced us to look up the literature of what we at first thought was an unusual condition. We found

that a number of articles had been written concerning primary tumors of the renal pelvis. Albarran and Imbert (6) and Savory and Nash (125) had published collected cases. Hryntschak (56) in 1920 collected 68 cases of papilloma of the renal pelvis; Spiess (133) in 1915 collected 136 cases of primary epithelial tumors of the pelvis and ureter. In this country, Lower (83) in 1914 and McCown (91) in 1920 published a series gathered from the literature. Kretschmer (75) in 1917 collected 42 case reports, and added one of his own, of non-papillary carcinoma of the pelvis. Since we began to look up this subject, Gilbert Thomas and Edward Regnier (141) published a study of 253 tumors of the renal pelvis and ureter, or which 5 were contributed by them. In February, 1924, Albert Scholl (130) published an article on papillary tumors of the renal pelvis, with complete reports of 8 cases from the Mayo Clinic. The description of the pathology of the tumors from these cases was especially thorough.

In our search of the literature we were able to find 178 cases of tumor primary in the renal pelvis, and to add the case already described. We did not include those cases in which the pelvic origin of the tumor was not reasonably certain. The varied nomenclature employed at different periods and by different writers is a source of confusion in the analysis of these cases. No less than 15 terms were used to describe the pathology of the tumors. The present trend in pathology is toward a simplification of classification, and the modern pathologist would probably group in one general class the so-called benign papillomata, the papillary epitheliomata, malignant papillomata and the papillomatous adenomata. These appear to be various forms of the same tumor, the differences being dependent upon the arrangement of cells, which in turn may be due to the rapidity of growth. Although some appear to be benign, it is conceded that all are potentially malignant. A quite distinct type of cancer is seen in the pavement epithelial carcinomata, in which keratinization has taken place, resulting in the formation of epithelial pearls. Those cases reported as infiltrating carcinomata and medullary carcinomata may have originated as the papillary type, and after necrosis of the superficial growth, assumed a

more solid form. Ewing (37) classifies tumors of the renal pelvis as (*a*) papilloma, (*b*) papillary epithelioma (or epidermoid carcinoma), and (*c*) alveolar carcinoma.

However pelvic tumors may be classified by the pathologist, there appear clinically to be two distinct types: (*a*) the papillomatous, in which transplantation to the ureter and bladder is frequent, which bleeds early and profusely, and in which metastasis is not particularly early; and (*b*) the non-papillary type, in which the ureter is involved only by extension, in which transplantation does not occur, in which hematuria is found in only 50 per cent of the cases, and in which metastasis to other organs, lymph glands and bones is the rule. These differences affect the diagnosis, the treatment and the prognosis. They have already been mentioned by Kretschmer (75), Scholl (130) and others, but it may be well to enumerate them once more.

In our collection of 179 cases, 142 were of the papillary type, 37 of the non-papillary type. Taking the series as a whole, we find that tumor of the renal pelvis occurs about twice as often in men as in women, and that almost 50 per cent occurred in the period between forty and sixty years of age. Thomas and Regnier (141) reported a malignant papilloma in a girl three and one-half years old.

SYMPTOMATOLOGY

Hematuria is the most frequent symptom, occurring in at least 70 per cent of the papillary type, and in less than 50 per cent of the non-papillary type. In the former, it is likely to appear at first in attacks, usually profuse, and often induced by labor or exercise. In a number of the cases in which blood was not present in the urine, the ureter was found to be blocked. The time which had elapsed since the onset of the hematuria was in some instances as long as fifteen or twenty years.

PAIN

Renal pain was stated to have been present in 71 cases of the entire series. It was sometimes dull, sometimes colicky. Ob-

viously, in the papillary type, pain is due to blocking of the ureter and the consequent hydronephrosis, or to the passage down the ureter of clots or pieces of tumor. In the non-papillary type, pain may be due to hydronephrosis or to an involvement of the nerves in the renal pedicle and to metastases in the juxta-aortic lymph glands.

CACHEXIA

Cachexia is not likely to occur in the papillary type, except in very advanced stages; although the hemorrhage may have greatly reduced the patient's strength. In the non-papillary type it was frequent, as the condition was usually not discovered until the disease was far advanced.

TUMOR

With the papillary type, tumor was most often due to hydronephrosis. Non-papillary cancers, however, often caused a hard tumor by actual involvement of the renal tissue. The presence of a tumor was noted in 73 cases of the series.

DIAGNOSIS

One need not instruct this audience in the significance of renal hematuria. Your first thought, in such a case, would be of renal tumor, and of pyelography. There are several possible sources of error, however. The pelvic outline may be normal even if the pelvis contains a tumor. Thomas and Regnier (141) report a case in which pyelograms done at the time of the first hemorrhage, four years before operation was finally performed, were negative. Seely (131) reports a case in which the pyelogram was normal, although there was a papillary carcinoma in the upper calyx. With a combination of renal enlargement and hematuria, one would feel justified in operating no matter what the pyelogram showed; the cases in which one may hope for a cure, however, are the ones in which we make a diagnosis before the kidney becomes palpable. The association of bladder tumor with renal hematuria is almost pathognomonic. The most difficult problem is that in which the pyelogram shows no filling

defect, yet in which there is no satisfactory explanation for the bleeding. Should such a kidney be explored? We believe that if there are no signs of nephritis or hypertension, an unexplained persistent renal hematuria demands operation even if the pyelogram is normal. This statement must be qualified to some extent. If there is a coincident ureteral colic not due to clots, one may assume that a stone is being passed, and may await developments. It must be remembered that profuse hematuria may be the first sign of renal tuberculosis, due to a small ulceration, and that the small amount of pus present in such an early condition may be concealed by the blood in the urine. Observation and research will in a few weeks rule out these possible factors, and will leave one face to face with the question of exploration. We doubt if exploration should be done because of a single attack of hematuria, but at least pyelograms should be repeated in 3 or 4 months.

Another misleading factor in the diagnosis of renal tumor is the coincident presence of calculus. In the 43 cases of non-papillary cancer collected by Kretschmer (75) stone was found in 11 cases. That writer points out the danger of accepting the stone as the sole cause of the hematuria. It is obvious that a pyelogram should be made in every case of renal calculus, to avoid falling into this error. In the papillary type, stone is much less frequent. While the incidence of stone in non-papillary tumors is 25 per cent, in the papillary type it is only 7 per cent. In many cases of pelvic tumor, a satisfactory pyelogram cannot be made because of ureteral obstruction. Such a fact in itself should arouse suspicion. The roentgenologist's report of "insufficiently filled pelvis" is another indication that the pelvis is already full of something, for if the catheter is well up in the ureter, the injected fluid should pass into the pelvis.

The diagnosis has been made by the finding of tumor cells or bits of tumor in the urine.

Differentiation between the various types of renal tumor by means of pyelography is very uncertain, as Kretschmer (75) has said. (Pyelograms exhibited showing deformities, either of which might have been found in a case of pelvic tumor, figs. 4, 5 and 6.)

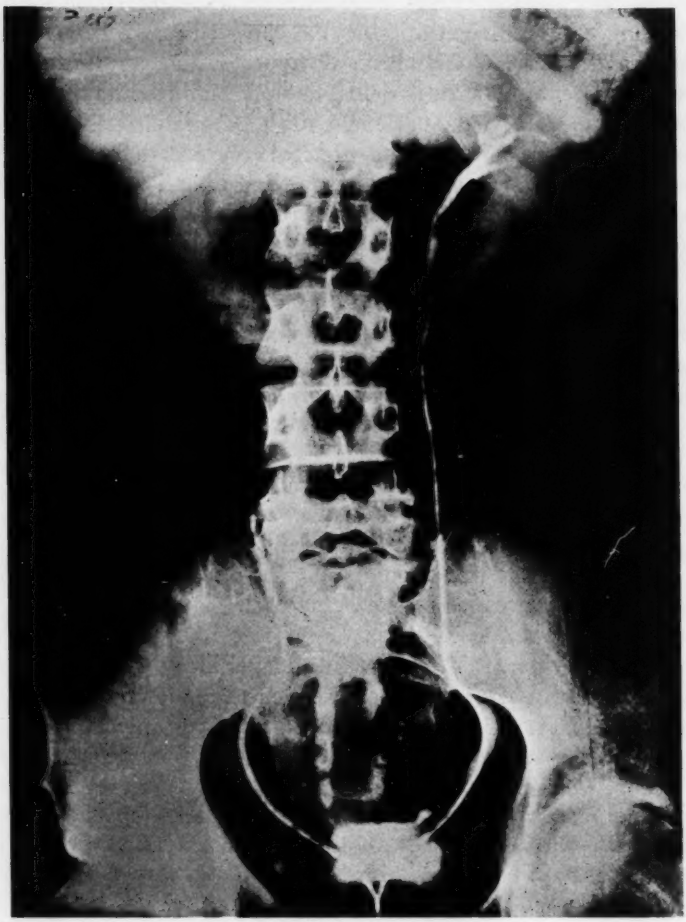

FIG. 4. PYELOGRAM SHOWING OBLITERATION OF LOWER HALF OF PELVIS

This was interpreted as a growth primarily pelvic, but proved to be a hypernephroma.

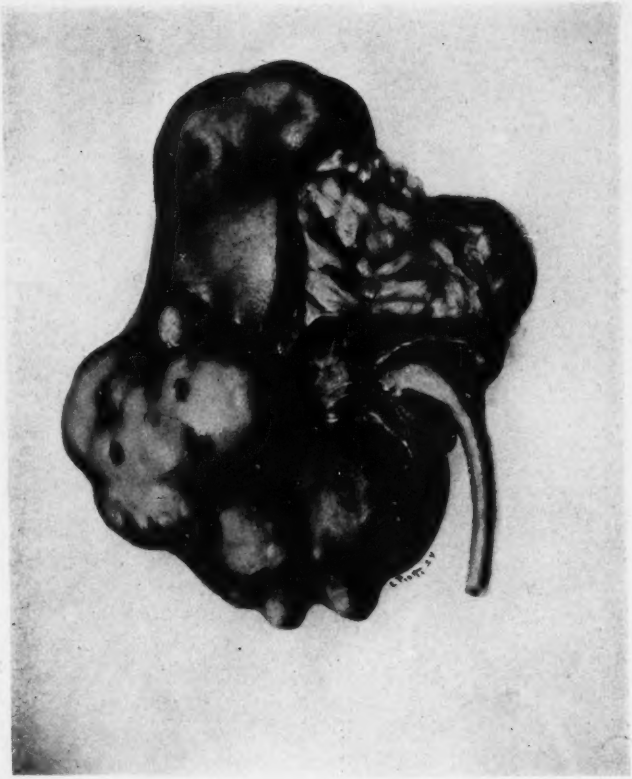

FIG. 5. DRAWING OF KIDNEY FROM WHICH PYELOGRAM IN FIGURE 4 WAS MADE, SHOWING MANNER IN WHICH EXTENSION OF THE GROWTH TO MESIAL OF PELVIS OBLITERATED THE PELVIS

This case illustrates the difficulty of diagnosing the type of tumor from the pyelogram.

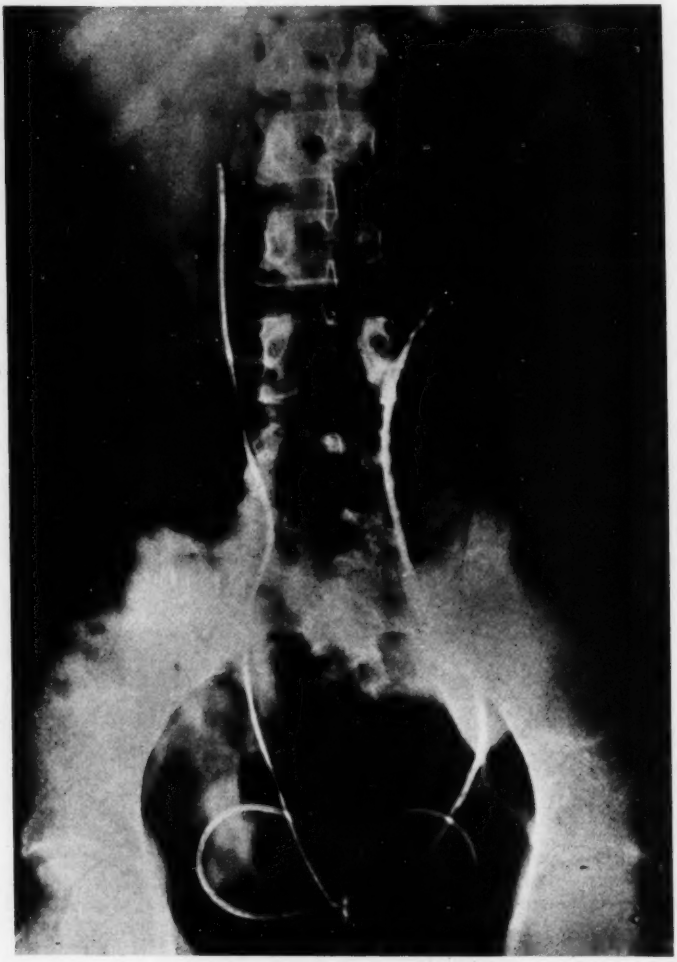

FIG. 6. PYELOGRAM OF A CASE OF CARCINOMA OF THE KIDNEY OBLITERATING THE LOWER CALICES AND OBSTRUCTING THE URETER

TREATMENT

It is now a well established fact that in the papillary tumor class, nephrectomy should be followed shortly by complete ureterectomy. This operation was first done by Albarran in 1899 and has been carried out in most of the recently reported cases. It is probable that a good ureterogram would show the presence of large transplants, but even if it were negative, we believe the ureter should be removed. If there were no evidence of ureteral involvement, it would seem that a removal down to the bladder wall, without excision of the intravesical portion of the ureter, would be sufficient; if coincident vesical growths are present, the ureter and adjacent bladder wall had better be removed. In our case, we found the median suprapubic incision very satisfactory for this operation.

Ureterectomy should be done as soon as possible after the removal of the kidney. Necker (104) has reported a case in which, following nephrectomy but not ureterectomy, the bladder became filled with a papillomatous mass, whereas six months before it was free of growth. Both operations have been done at the same time, but this would appear to be unwise except in patients in unusually good condition.

Inasmuch as the non-papillary carcinomata of the renal pelvis do not extend by transplantation, but only by continuity, it would seem justifiable to leave the lower portion of the ureter, provided it were divided well below any area which on palpation felt indurated. To follow up all of these operations with deep X-ray therapy would appear to be wise, because of the possibility of destroying an early metastatic focus.

PROGNOSIS

In dealing with a relatively early case of papillary tumor of the pelvis, there is reason to believe that if the ureter is removed as well as the kidney, one may hope for a cure. A number of such cases have been reported. All such patients should be cystoscoped at least every six months, as vesical tumors may develop. The benignity of the tumor removed is not necessarily

a guarantee of cure, for not infrequently malignant metastases from such tumors have been found. The prognosis of non-papillary tumors is very poor, because they are usually not discovered until far advanced, and because they metastasize freely.

CONCLUSIONS

Tumors of the renal pelvis may be divided into papillary and non-papillary groups.

The papillary group tends to extend into ureter and bladder by transplantation, and is relatively slow to metastasize.

The non-papillary group involves the ureter only by extension and metastasizes freely and early.

Hematuria has been found with the former in over 70 per cent; with the latter in only 50 per cent.

Stone has been found to be associated with the former in 7 per cent; in the latter in 25 per cent.

In papillary tumors, the ureter should be removed as well as the kidney; in non-papillary tumors, complete ureterectomy is seldom necessary.

The prognosis in the latter group is much worse than in the former.

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HEMANGIOMAS OF THE BLADDER AND URETER

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Tumors of vascular origin of the bladder and ureters are so rare that the following cases seem worthy of report. The first, being a telangiectatic hemangioma of the bladder wall; the other, a pulsating cavernous hemangioma of the ureter simulating inoperable carcinoma of the bladder. I group these 2 cases, since the angioma of the ureter made its impression beneath the mucous membrane of the bladder in two places eroding it with the production of hemorrhage, so that at first it gave every appearance of a vesical growth.

Hemangiomas of the bladder are extremely rare. The first observation of such a tumor in the bladder was by Gross (1). The patient was a woman seventy-two years of age, who suffered from hematuria. A soft irregular cauliflower tumor was found at autopsy, but no histologic description was given.

The first authentic tumor of this type was described by Albarran in 1892 in a man sixty-four years old, who had suffered from hematuria. He died at operation by Guyon. Microscopic examination showed capillary dilatation surrounded by connective tissue. The tumor was sub-mucosal and bladder epithelium was well preserved.

In 1909, Dr. Robert Bryan of Richmond reported a typical cavernous angioma which he removed by suprapubic cystotomy. At this time he remarked that he had been able to find no reference to such a growth in the bladder, except by Albarran (2) and Langhaus (3).

Judd and Harrington (4) report of a large polypoid tumor filling a greatly hypertrophied bladder extending through the bladder wall into the right extravesical space with a growth as large as a grape fruit.

Launay, Achard and Carriere (5) reported a large angioma the size of an orange removed from the posterior and right lateral wall of the bladder by partial cystectomy from a patient who had complained of frequent painful urination with hematuria and pain in the right iliac fossa. Diagnosis was appendicitis and the operation performed for this condition. The tumor was composed of large dilated blood spaces filled with clots surrounded by connective tissue.

Thomas described a small angioma of the bladder which was cured by fulguration similar to my first case above described. Lane reports a cavernous angioma of enormous size in a child three years of age. Jungano observed a massive cauliflower angioma of the trigone undergoing sarcomatous degeneration. The most recent report of this rare bladder condition is by Frank Kidd of London (6) He reports a polypoid pedunculated tumor attached to the anterior wall of the internal meatus projecting into the bladder in a patient who had suffered from acute retention of urine with severe cystitis, but only slight hematuria, which followed catheterization in one or two instances. The tumor he described, as looking like a raspberry, was removed by suprapubic cystotomy and found to be composed of a central core of muscle similar to that of the bladder covered by bladder epithelium. This central core of the muscle contained large and numerous blood vessels, which on section proved to be angiomatous. He designated his tumor as angio-myoma.

Scholl (7) speaks of the rarity of angiomata of the bladder. These tumors may be small and have as their only symptom a persistent profuse hematuria; or they may be extensive and penetrate into the prevesical tissues simulating growths of other pelvic organs. Watson found but two angiomata in 653 collected tumors. It is therefore evident that hemangiomas of the bladder are very rare tumors which have as their usual symptom hematuria, which has tendency to be constant. Unless they involve the bladder outlet or attain an enormous size, this maybe the only symptom.

After a careful search through literature, I have been unable to find a single report of a hemangioma of the ureter. It seems

therefore that my second case is unique. The striking feature of this tumor was its pulsation. I have seen no description of pulsation mentioned in any of the other tumors. The pulsation in this tumor was indeed pronounced and it would seem from the structure of these growths that such a finding should be common, it depends, of course, on the relation to the artery. The explantion of the terminal bleeding in this tumor is that, at the expulsive effort at the end of urination, the bladder contracted against this vascular mass which was between its walls and had begun to erode the mucous membrane. The case is of great clinical interest, because it so simulated an infiltrating cancer of the bladder wall.

Case 1. Male, aged thirty-five, consulted me in April, 1918, complaining of the passage of blood in urine.

Past history. Entirely negative, except that he had gonorrhea as a young man, but no history of lues. There had been no history of birth defects in his family and he had never been seriously ill.

Present illness. Was perfectly healthy until six weeks before admission, when he, without premonition, began passing blood in the urine. He described the blood as being entirely mixed with the urine and having the appearance of dark wine. The bleeding had been constant during this period, but on several occasions had been less profuse. There had been absolutely no other urinary disturbances. No history of pain in kidney regions, nor any reflected pains in back or legs. Sexual powers normal. No loss of weight, but patient felt he was a little weak from loss of blood.

Examination. Healthy looking man, somewhat pale. General examination was entirely negative. No abdominal masses. External genitalia normal. Urine passed in 2 glasses, dark brown in each. Microscopically contained blood, but no infection. Rectal examination. Sphincter tone good. Prostate normal in every way.

Cystoscopic. Cystoscope entered easily. Bladder washed clean. On casual inspection, it seemed to be entirely normal. Ureteral orifices were normal and clear urine was seen coming from each. After a careful search there was observed on the left lateral wall of the bladder approaching the sphincter margin a very small spider-web dilatation of blood vessels, in the center of which was a pinpoint bluish elevation, from which was issuing a constant fine stream of blood.

The bladder wall in the vicinity of this growth was entirely normal. The tumor had the appearance of an ordinary naevus.

Diagnosis: Hemangioma.

Treatment. The tumor was burned with high-frequency current and completely destroyed. Patient was cystoscoped a week later and at the site of burning there was a small ulcer. At the end of a month the ulcer had entirely healed, leaving no evidence of the previous tumor. Patient has remained well.

Case 2. Woman, aged sixty, consulted me in October, 1923, complaining of passage of blood in the urine.

Past history. Entirely negative, except for an attack of bleeding.

Present illness. Five years ago passed a little blood at the end of urination. This lasted for one or two acts, subsided, and did not recur until two weeks ago. In the meantime there has been absolutely nothing to concern her. Two weeks ago, without cause, began passing blood in the urine. Blood has been bright and usually occurring at the end of urination. Urine has never been dark and she has never passed clots. No frequency, difficulty of, or pain on urination. No pains in back, legs, or history of renal colic. No fever, chills, or loss of weight, but she has been very nervous. The day before I saw her she had consulted a gynecologist, who found, upon making a vaginal examination, that there was a very hard, indurated, area on the vault of the vagina corresponding to the base of the bladder in the region of the trigone, situated a little to the right of the median line. This mass was about 1 to 1¼ inch in length and about ¾ inch in breadth. The same physician had sent me a patient a year previously with, as he said, the identical palpable findings and the mass proved to be due to an infiltrating squamous cell carcinoma of the bladder wall.

Examination. Patient was a stout, healthy looking woman. Her general examination was entirely negative. Upon vaginal examination, I felt this indurated mass which was exactly similar to the case above alluded to which proved to be cancer. The mass was very hard, very fixed, but not sensitive.

Cystoscopic. Bladder capacity was normal. Urine slightly tinged with blood. Upon examining the bladder, there was observed a peculiar condition of the left lateral wall and base starting from the left ureteral orifice and running outward and upward (fig. 1). The bladder wall gave the appearance of rigidity. The mucous membrane was quite smooth over this area, which had a peculiar mottled appearance

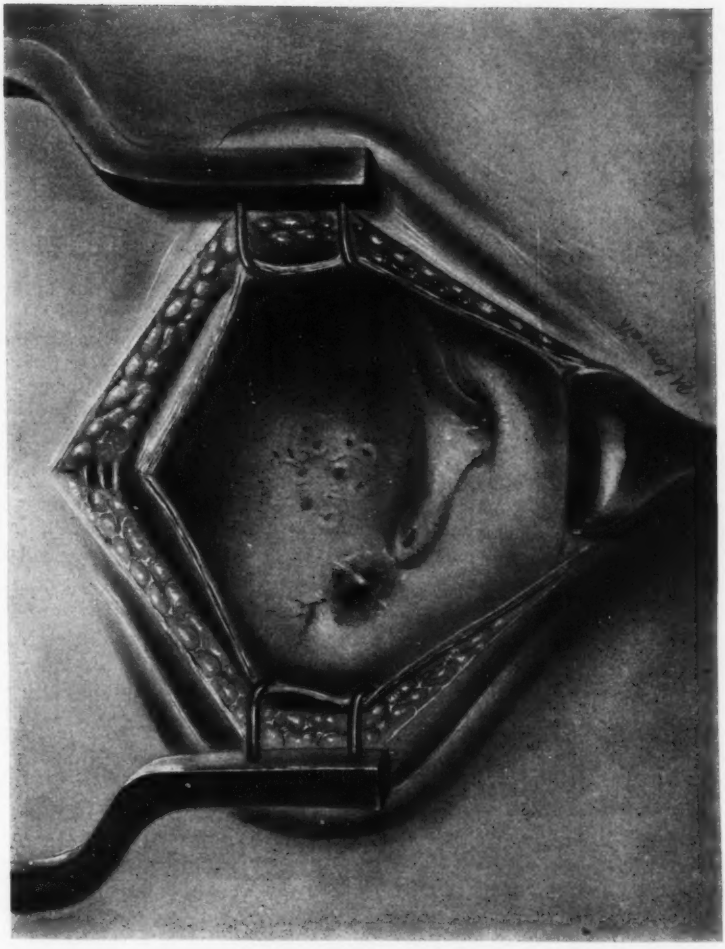

FIG. 1

consisting of areas of blue and almost black spots intermingled with lighter cystic looking masses, between which there were slight corrugations. This area seemed about 1 inch in length and about ¾ inch in diameter and corresponded exactly to the size of the vaginal induration. At the outer edge of this mass there was a typical telangiectatic spider-web dilatation of vessels. In the center of this thickened area there were two spots with adherent small blood clots. The striking feature of this whole area was its pronounced pulsation. There was no projectile growth in the bladder cavity. Catheters were passed up the ureters and they were both perfectly free and the urine from the kidneys was clear. With the finger in the vagina, pressure on this indurated area elevated the bladder growth. No pulsation could be felt through the vagina.

My associate, Dr. Sanford, and I were both struck with the marked pulsation of the tumor and this coupled with the telangiectatic area at the upper part made us feel that the tumor was very vascular and most probably a hemangioma, but faced with the rigid appearance of the bladder wall, the infiltration of the vaginal vault and associated hematuria, carcinoma of the bladder with extension seemed inevitable.

On November 30, 1923, I did a suprapubic cystotomy. Upon freeing the right side of the bladder down to the vault of the vagina, I felt a very hard, stonelike mass binding the bladder and the vaginal vault together. After exposing this mass, I was able to dissect it out quite nicely, and it proved to be a large calcified lymph gland plastering these two structures. It was located at the juxtavesical ureter. After removing the gland, the vaginal vault felt perfectly soft. Bladder was opened freely and the area which had been observed cystoscopically was seen. There was no hardness, the mucous membrane was perfectly smooth. With the palpating fingers on the outer side of the bladder and the thumb within its cavity, there was felt between them an elliptical mass about the size of a large pecan, quite movable and having a rubbery feel. Upon delicate pressure it could be felt to pulsate. The posterior wall was opened with an incision running from the tip of the trigone upward and outward external to the outer margin of this mottled area of mucous membrane. Upon incising the mucous membrane, there presented a mass which was quite irregular, firm, and elastic. It was easily separated from the mucous membrane of the bladder, which it had partially eroded in one spot, this being the spot to which the blood clot was adherent upon previous cystoscopic examination. On further study, it was found that the growth

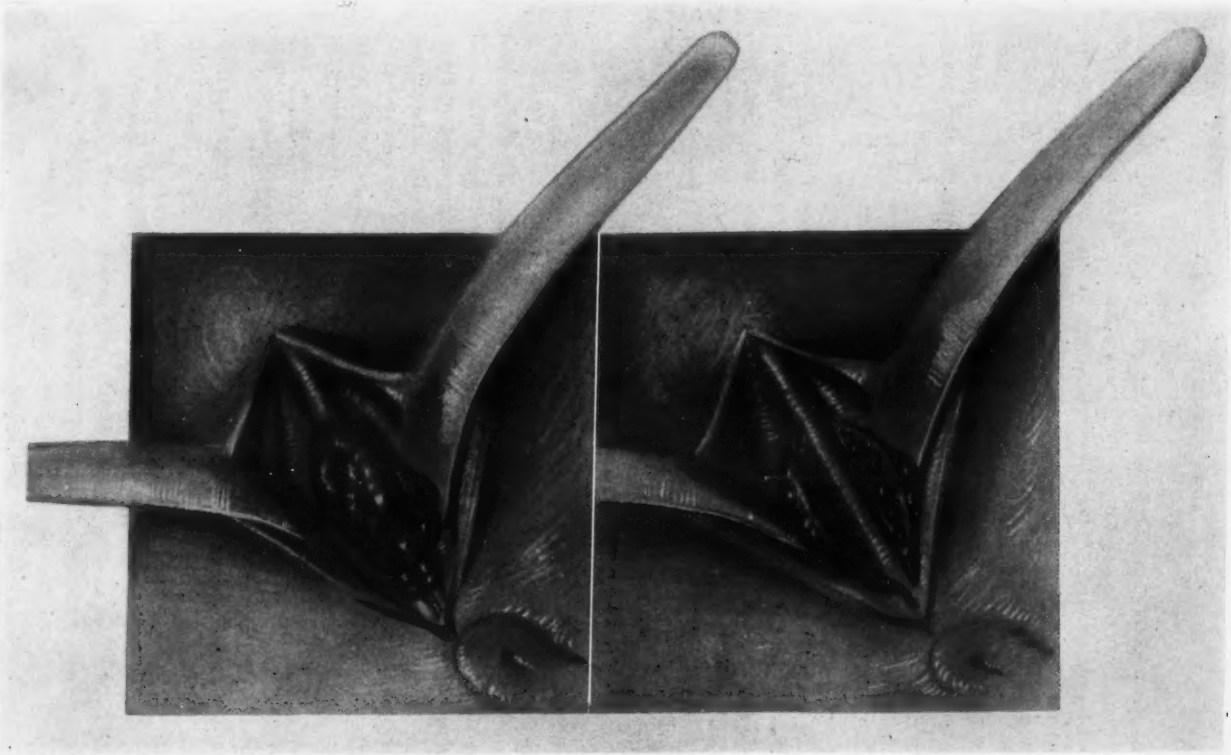

FIG. 2

had completely encircled the ureter, which was exposed for at least 2 inches from its juncture to the bladder (fig. 2). The mass was quite encapsulated and under the surrounding fascia could be seen the irregular conglomerate masses of vascular dilatations. The tumor was incised on its anterior surface about the ureter until the wall of the ureter was exposed, grasped on either side with clamps and completely freed from the wall of the ureter. It was adherent in several places to the adventitia. The chief attachment was at the lower part, as the ureter entered the mucous membrane of the bladder. Here there was a vessel the size of a small match, which was ligated and the tumor removed entire, leaving the ureter intact. It had not constricted the ureter or produced any evidence of obstruction. After the removal of the growth there was no evidence of palpable mass in the bladder wall. The mucous membrane over this growth was resected, the posterior wall of the bladder was sutured, bladder closed as usual around a tube drainage, cigarette drain in the space of Retzius, another placed in the lateral cavity in the neighborhood of the ureteral portion.

Patient made satisfactory recovery and is entirely well. Cystoscopic examination three and one half months after operation shows no sign of bladder wall involvement, bladder being entirely healed and normal in appearance.

Pathological examination. The tumor was rather firm and opened out as it was between two clamps, measured about $1\frac{1}{4}$ inch in length and about 1 inch in width and $\frac{1}{2}$ inch in thickness. On section it was seen to be composed of large dilated spaces filled with blood clots, between which there was a definite mass of fibrous tissue. Some of the spaces were quite large. Microscopically the tumor seemed sharply circumscribed composed of large irregular spaces filled with blood, lined with endothelium, between which there is a fibrous tissue stroma and numerous smooth muscle fibers, one artery of considerable size is seen in cross section. It shows extensive calcification and thickening of its walls, a pronounced senile artero-sclerosis. A small portion of the bladder wall which was removed with the tumor is normal, except that it shows extravasation of blood between the muscle bundles. There are several areas of pigment deposit, apparently result of previous extravasation.

Pathological diagnosis: Characteristic hemangioma of the cavernous type.

A NOTE ON THE RESULTS OF DECAPSULATION OF THE KIDNEY FOR VARIOUS FORMS OF NEPHRITIS

WM. C. QUINBY

From the Urological Clinic of the Peter Bent Brigham Hospital, Boston, Massachusetts

Owing to the persistence of reports in the literature of the beneficial action of decapsulation of the kidney in nephritis, the medical service of the Brigham Hospital has asked me to perform this operation in certain selected cases. It would seem that the feeling is still prevalent that in some forms of nephritis this operation should be advised because of the supposed increase in or modification of the vascular supply of the organ which may follow.

Three cases are reported: One a case of hemorrhagic nephritis, one of acute tubular nephritis from bichloride poisoning, and one of chronic glomerular nephritis with edema.

After bilateral decapsulation these cases were followed carefully with respect to their blood chemistry, as well as other more general observations, and in none of them was any benefit whatever, not even of a temporary character, to be demonstrated. The case of bichloride poisoning died at about the expected time, namely, five days after onset: the other two cases are still under observation in the nephritic clinic, their course since operation apparently uninfluenced by this procedure.

PATHOLOGICAL REPORTS

Case 1. A man, aged twenty-three, April 21, 1921, No. 14413.

Material. Tissue from kidneys, April 23, 1921.

History. Patient complains of hematuria of two years duration which began with an attack of influenza. He has had frank blood in his urine which has increased with exertion or whenever he bends

over. This has also been accompanied by pain in the back. Physical examination is essentially negative.

Operation. Bilateral decapsulation of kidneys.

Gross description. Patient has had acute attacks of hemorrhagic nephritis and a decapsulation of the kidneys was advised by the medical service. It was observed at operation that the kidneys bled less freely than normal kidneys when the capsule was stripped. Surfaces of the kidneys are granular. When incised they bleed less freely than normal kidneys. Two small pieces are removed from the left kidney and one small piece from the right.

From these pieces cultures were made in deep dextrose agar II, dextrose broth and in dextrose serum. These media, two tubes of each, had introduced into each a small piece of kidney cortex.

Microscopic report. Of eleven tubes inoculated, one tube of broth became contaminated. The other tubes remained sterile.

Sections stained with Giemsa's stain for microörganisms and phosphotungstic acid hematoxylin. Histological examination of three pieces show identical processes in both kidneys. The cortex is traversed by bands of anastomosing areas of cicatricial tissue enclosing sclerosed glomeruli and atrophic tubules. The striking feature in all sections are the changes in the glomeruli. There are very few glomeruli which approach normal. In all others there is a great diminution of blood supply and a marked increase of hyalin connective tissue which completely obliterates the glomeruli in many cases while preserving their shape. The common appearance is to have capillaries containing blood restricted to the periphery of a lobulated hyalin connective tissue mass containing a few nuclei. In some glomeruli there is a proliferation of the capsular epithelium and others show a marked connective tissue deposit around Bowman's capsule. Tubules which evidently belong to the stumps of sclerosed glomeruli, are atrophic and surrounded by zones of hyalin connective tissue outside of which is a loose connective tissue containing numerous lymphoid and plasma cells and an occasional polynuclear. A few glomeruli also show deposits of fibrin and polymorphonuclear leucocytes. There are no blood vessels of large size in the section. Small blood vessels, arteries in particular, show hyalin deposits and thickening of the intima but there are quite normal arteries as well. In one section from the left kidney there are convoluted tubules filled with blood. It is not clear how this blood reached the tubules. There is no hemorrhage in any of the glomerular spaces or into the interstitial

tissue. It seems possible that the manipulations during the operation and incision might account for the blood in the tubules.

Diagnosis. Intracapillary glomerular nephritis; acute and chronic.

Case 2. A man, aged twenty-five, January 18, 1923, No. 18127.

Tuberculosis of spine of four years duration, with psoas abscess. Four $HgCl_2$ tablets taken "last night." Used them usually to disinfect wound in groin. Followed by violent vomiting of blood. Reached Peter Bent Brigham Hospital in three hours. Put on routine anti-$HgCl_2$ treatment. Continued unable to retain anything in stomach.

Advise decapsulation to relieve any pressure from edema followed by hypertonic glucose solution in hope of getting diuresis. Thirty hours after entrance only 10 cc. of urine obtained. B.U.N. 54 mgm. Died January 23, 1923.

Microscopic report. Diffuse involvement of kidney practically confined to tubules. The large majority of the latter are destroyed and replaced by a homogeneous acid staining mass. The space between the tubules is markedly infiltrated with polymorphonuclear lymphocytes. Slight hemorrhage is also present. There is beginning repair on the part of the tubules, and in many places flattened epithelial cells already line the tubules, and in other places mitotic figures in the tubular epithelium are not hard to find. Many tubules show no attempt at regeneration. The glomeruli are markedly congested and contain polymorphonuclears. They differ somewhat in size. Acute diffuse tubular nephritis from bichloride of mercury poisoning.

Case 3. A man, aged thirty-four, January 23, 1924, No. 20746.

Material. Tissue from kidney, February 16, 1924.

History. Present illness started four months before patient's first entry to hospital in January, 1922, with gradual onset of edema of face and legs. Urine showed many hyaline and granular casts and some waxy casts. Phthalein was 57 per cent, B.U.N. 12 mgm. Patient again entered the hospital in April, 1923. An albuminuric retinitis had developed. B.U.N. had risen to 32 mgm. Phthalein had dropped to 27 per cent. Urine remained the same. He entered for the third time in January, 1924, after having had two attacks of unconsciousness, resembling uremic coma.

Operation. Decapsulation of both kidneys.

Gross description. Specimen consists of two small fragments of kidney tissue removed from the cortex of the right and left kidneys respectively.

At operation the capsules of the kidneys stripped with relative ease, and revealed a smooth, red surface in which elongated, shallow depressions were evident, possibly the remains of fetal lobulations. On section the cortex extended from the periphery into the kidney for a distance of about 0.8 cm. They are approximately 2 cm. in length and 0.5 cm. in thickness. Fixed in Zenker.

Microscopic report. Four sections of left kidney and four sections of right. All of the slides show essentially the same picture, hence only one will be described. There is a marked diffuse chronic glomerular nephritis. Practically no normal glomeruli are seen and all stages of glomerular destruction are found. In some instances there is nothing but scar tissue remaining in place of glomeruli and others have an increase of scar tissue in the capsule. Still others show proliferating epithelium in the capsule and fairly well formed crescents. The glomeruli vary considerably in size and in practically all cases there is an increase of hyaline substance around the capillaries of the tuft and in many are polymorphonuclear leucocytes.

The tubules likewise show various stages of destruction but not so generalized. Some are completely destroyed and only scar tissue remains, while others have their cells filled with fat droplets in varying degrees. Others appear fairly normal. Many casts are seen, both hyaline and granular. The destruction of tubules seems to be rather patchy. Certain areas show a marked increase of interstitial tissue containing various types of wandering cells. Scattered throughout all the section are fairly large groups of lymphocytes. Both kidneys seem to be involved to about the same degree and in the same manner. Some of the blood vessels show an irregular thickening of the intima with fraying of the internal elastic membrane; but this is not general. The primary lesion seems to be glomerular with secondary changes in the tubules and arterioles.

Diagnosis. Chronic glomerular nephritis.

A NOTE ON THE LOCALIZATION OF RENAL CALCULI BY THE AID OF X-RAY FILMS MADE DURING OPERATION

WM. C. QUINBY

From the Urological Clinic of the Peter Bent Brigham Hospital, Boston, Massachusetts

The important aid which the X-ray affords the surgeon in the immediate localization of renal stones at the operating table, needs no longer any emphasis. Its use has entirely superseded the older and cruder methods such as needling the kidney, or exploratory laparotomy. Granting this, the present remarks deal only with the matter of roentgenological procedure.

The most direct and quickest exploration of the kidney is that made with the fluoroscope. By its use the observer can very accurately direct the surgeon to one or another portion of the kidney in which the stone lies. The fluoroscope, however, produces no graphic record of the kidney, and because of the apparatus involved as well as the need of eyes whose pupils have become well dilated by darkness, the surgeon cannot see the stone shadow for himself. He must depend on the word of the observer.

A second method of acquiring X-ray evidence is that which I wish to advocate; namely, the exposure of the flexible films, wrapped in light tight paper, and held closely apposed to the kidney in much the same way as dental films are made. The film is then immediately developed and serves as graphic evidence of the number and position of calculi within the organ, as well as of their physical characteristics. Also, calcareous detritus, which if allowed to remain will serve as a nucleus for the formation of a second stone, can be accurately visualized and removed either by the blunt spoon or by washing. In some of the more complicated cases several films will be made, but

the final one should show the kidney free from all traces of shadow-casting material.

For purposes of record, too, it is exceedingly gratifying to be able to demonstrate a film of the kidney itself without any intervening structures, which will bear witness at any time subsequent to operation that the organ was in fact made by that operation entirely free from stones. This point is so important that we now make such a film at the end of each operation for renal stone, even though the aid of the X-ray was not necessary in order to locate the stone.

In some instances of marked perirenal pathology often due to one or more previous operations, it has been impossible to exteriorize the kidney to a degree sufficient to permit satisfactory X-ray examination. Such cases are rare, however, for with a directly transverse incision it is possible to mobilize a kidney upward and toward the midline to a degree often impossible through the more oblique approach.

DISCUSSION

Dr. Gilbert J. Thomas (Minneapolis): I am certainly very much interested in the papers of Drs. Patch and Smith concerning papillary tumors of the kidney pelvis. I have had 5 of these, 1 a young child who died shortly after the operation from metastasis. Post-mortem was not obtained. One of these was a post-mortem case, and the others lived—1, three years, another two and one-half, and the other about two years—without evidence of metastasis.

Dr. Henry G. Bugbee (New York): Regarding Dr. Kretschmer's presentation, I have recently with the pathologist at the Babies' Hospital in New York, reviewed all the autopsies performed there (4903 babies), and found in that series 117 renal anomalies. Of the 117, 101 in children who died under one year of age there was 1 case of solitary fused kidney.

Dr. Nathaniel G. Alcock (Iowa City): With reference to Dr. Kretschmer's case, it was of very great interest to me because I have had the misfortune to have removed a kidney from just such a case with, of course, fatal result. The case came into the hospital with a history something like this: It was a boy ten or eleven years old who had developed three weeks previous to admission a pain in the abdomen at McBurney's point and his family physician had detected a small mass which at that time was said to be about as large as a small egg. According to the history, this mass had gradually increased until at the time of his admission it was said to be about as large as a good sized fist and could easily be palpated. The patient had absolutely no urinary history and the urinalysis was negative for pathological findings. The patient was admitted to the general surgical service and an exploratory laparotomy was done on

the probable diagnosis of an appendix. I did not see the patient until the abdomen was opened.

We found a large kidney on the level of McBurney's point. The lower pole of it was irregular and lobulated and quite hard. The color was not particularly abnormal. I felt over on the left side and I thought I detected another kidney and on account of the history of this tumor mass increasing rapidly over a period of three weeks I decided to take the kidney out.

After I had removed the kidney the pathologist failed to find any evidence of tumor but he did find a double pelvis and the diagnosis was that of unilateral fused kidney. The patient died on the twenty-first day following operation and the autopsy showed the left ureteral orifice to be absolutely normal as to location. The left ureter passed out from the bladder normally and then curved around the pelvis low down and crossed over to the right side and went up parallel to the right ureter. Before removing the kidney I had found the right ureter.

This case has taught me at very great expense the inestimable value of double pyelography. A cystoscopic examination here without a left pyelography would have missed the diagnosis entirely.

Dr. Benjamin S. Barringer (New York): Dr. Chute has brought up an interesting point. I recently did a nephrectomy for tuberculosis of the kidney and found a ureter which was as large as my thumb running directly along the vena cava and continuously adherent to it.

I had one rather rare result in opening the vena cava in doing a nephrectomy for tuberculosis of the kidney; the kidney broke and the wound was infected. There were no clamps left on, and the pedicle was tied. Ten days after the patient was lying in bed when there was a sudden gush of blood and he died immediately. The vena cava had suppurated through.

Dr. Hyman recently told me of a case of Beer of New York, a hypernephroma which was found growing into the vena cava. The kidney was opened, the hypernephroma removed, and the interesting point is that the patient lived for several years afterwards without any metastasis.

Dr. DAVID W. MACKENZIE (Montreal): In regard to Dr. Chute's paper, I have been unfortunate enough to have had 1 such case, and I thought for a time, 2. The first one was five years ago, an Italian about thirty years of age who came to the hospital with a tubercular epididymis and tubercular kidney. I promised him I would remove the epididymis at the same time as the kidney. I did not. As I removed the kidney I side-swiped the vena cava just below the pedicle. Needless to say the bleeding was profuse; we controlled it after a time and finally sutured with catgut. After I had sutured it I was not satisfied that the thing was going to work, so I did a sort of Lambert of the fascia about the venal. He made a good recovery and two months later I removed the epididymis. Last winter he was living and well.

The next case was in which I was quite sure I had injured the vena cava, but found I had only side-swiped one of the large veins and not the true vena cava.

I want to refer to the papers of Drs. Patch and Smith and congratulate them upon the thoroughness with which they have taken up the literature of this study.

I brought today, in connection with Dr. Caulk's paper on angioma, slides of a case of angioma of the upper pole of the kidney involving the renal pelvis, in a young man of thirty. You can see the large blood channels with their endothelial linings and the fibrous tissue surrounding them. This man gave a history of bleeding for fourteen months. The pyelogram does not show anything very typical but slight irregularity of upper calyx.

Dr. A. H. CROSBIE (Boston): I would like to cite a case that bears out what Dr. Patch brought out in his paper, and that is the importance of removing the ureteral orifice in cases where the papilloma involves the ureter. Three years ago Dr. Graves reported a case of papilloma of the kidney pelvis where the kidney was removed. There was bleeding, the ureter was resected, and was found to be filled with papilloma. About four months ago I saw this man, with a large papillomatous mass protruding

from the right ureteric orifice. I opened the bladder and resected the stump of the ureter and ureteric orifice.

Dr. JOHN H. CUNNINGHAM (Boston): I had an experience about fifteen years ago which is recalled to my mind by Dr. Chute's paper. The patient was a young Englishman who had consulted several of the foremost surgeons in Europe, and one of them, believing he had a tuberculosis of the kidney, operated, and not finding the kidney obviously tubercular, left it untouched. Some months later the patient came into my hands. Study determined that the kidney, which had been previously exposed, was unquestionably tubercular.

I do not know whether you gentlemen have noted that each of the speakers today have referred to their nephrectomies as "easily accomplished." I believe we will all agree that this is not always the case, however. In this instance it was very difficult, dependent in part, in all probability, to the previous operation, and the extensive tubercular destruction of the kidney, and invasion of the surrounding tissues. At that time I was performing nephrectomies through a straight lumbar incision, and not the muscle splitting incision now so generally employed.

The vena cava was torn, and the bleeding profuse. It was entirely controlled by grasping the rent in the vena cava with the hand. Exposure, by a muscle splitting incision, was then made sufficient to deal with the situation. Having made the proper exposure, clamps were placed along the edge of the rent in the vena cava, which was about 2 inches in length, and on the side of the vessel in its long axis. Small right angled clamps were used, and so placed as to make the edges of the tear project for about a centimeter from the clamps.

With an ordinary blood vessel linen suture in vaseline, I ran a Cushing stitch along the free edges, close to the clamps, and then reinforced this by uniting the free edges of the tear by a continuous suture of the same material.

With some trepidation the clamps were removed. The repair was without leakage, and the young man lived about eight or ten years. I learned from our fellow member, Dr. Al-

fred Osgood, whose patient he was at the time of his death, that he died of a tubercular meningitis.

Dr. A. J. CROWELL (Charlotte, N. C.): I would like to call attention to the importance of the specific gravity in differentiating kidney function. Three years ago Dr. Fullerton of Belfast, Ireland, called our attention to its value in ascertaining the separate renal function. We decided to test its comparative value with phthalein and in 125 consecutive cases found them equal in value and feel just as safe in depending upon it as upon the phthalein. We have so much confidence in its accuracy in ascertaining kidney function that we are taking the specific gravity now instead of doing the phthalein. Three cubic centimeters of urine from each side is all that is necessary for this test. This can be obtained in a very few minutes by following this plan of kidney function estimation.

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THIRD DAY, MAY 28, 1924

PATHOLOGY OF THE POSTERIOR URETHRA

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Pathological conditions of the posterior urethra are so common and many of them respond so readily to treatment, that some of us are failing to afford relief simply because we have not used the urethroscope. Fulguration plays such an important part and is so easily and successfully employed, that its use has now become universal.

Bugbee has called our attention to congenital hypertrophy of the veru, citing a case of his own and reporting seven cases found at autopsy, in which obstruction at the vesical neck, with hydronephrosis and hydroureters had been caused by congenital hypertrophy of the veru. This was something entirely new but that it is not always congenital we know full well, for we have seen cases giving all the classical symptoms of hypertrophy of the prostate in whom no hypertrophy could be detected; the obstruction being clearly caused by an enlarged veru montanum. It has been my experience that the size, shape and congestion of the veru are often entirely out of proportion to the symptoms manifested by the patient. With the dictum, "the veru is the mirror of the seminal vesicles," I am fully agreed, but that it always reflects the true condition I certainly take issue. Although startiling results are often obtained by topical applications to the veru, I maintain that the true pathology lies in the prostate, seminal vesicles, bladder or kidneys and must be eradicated before the patient can be cured.

That all men have chronic prostatitis and seminal vesiculitis there is little doubt, but of such low grade intensity no symptoms are apparent. The high strung individual, the neurasthenic and

the previously healthy young man who has indulged in frequent and rather prolonged petting parties are the cases that come to us for treatment. It is the last type that is the most amenable to treatment while the neurasthenic will tax our ingenuity to the utmost and defy every method known to the urologist. The treatment that I employ in such cases depends upon the symptoms and the pathology found in the prostatic urethra, seminal vesicles, bladder, prostate and kidneys. If the bladder and kidneys are involved, appropriate measures must be applied, while in all cases careful and long continued treatment must be directed to the inflammation in the prostate and vesicles. If the veru is congested, swollen and bleeds easily, topical applications of 20 per cent silver nitrate or better still, fulguration, will work wonders, especially in those cases with frequency and burning on urination. Irrigation of the bladder with silver nitrate 1:10,000 following prostatic and vesicular massage; the passage of sounds, previously cooled in ice water or covered with carbolic or silver nitrate ointment or the use of the Kohlman dilator to 35 or 45 F.

In those cases where the veru is small and anemic, dilation and irrigations of silver through the Guiteras tube, instead of fulguration and applications to the veru. Even in such cases however, if there is frequency and bladder irritability, fulguration often relieves more than other treatment. Vasotomy, hot sitz baths, hot rectal irrigations, electrically heated sounds, vacuum electrodes, urethral and rectal, all have their place, but it has been my experience that if the patient still suffers after we have relieved the inflammation in the prostate and vesicles and the congestion and inflammatory swelling has subsided in the veru and prostatic urethra, our further efforts will be only partially successful.

It is a fact also that patients are often wonderfully benefited by applications to the veru or by the puncture of a cyst in the prostatic urethra, only to have the symptoms return if we have not eradicated the pathology in the adjacent structures. The gross pathological findings of the posterior urethra, consist in congestion and the peculiar dark red globular areas that I have termed "ecchymotic tears" and all manner of distortions of the

veru, as depicted so well by Luys and Wolbarst with tumors growing from, to the side of and often overlapping and completely hiding the veru from view.

Papillomata of the urethra are classified by Randall into three groups: (1) benign fibrous polyps, (2) benign villous polyps and (3) benign glandular polyps. The method of removal may be by a snare, as advocated by McKenna, by rongeur forceps as advocated by Randall, and by fulguration almost universally used, its only objection being the destruction of the papilloma, thus preventing a pathological report on the type of growth.

CASE REPORTS

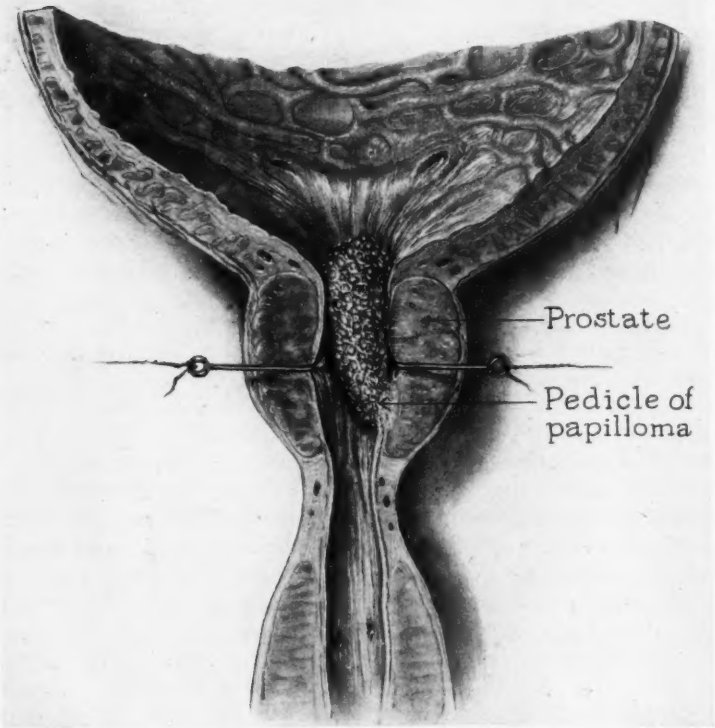
Case 1. A. R. January 27, 1923. White, male, married. Aged forty-seven. History of gonorrhea twenty years ago. No symptoms since till six weeks ago when began having frequency, burning, nocturia and some difficulty in voiding. Has been treated by prostatic massage and irrigations without benefit.

Examination. Prostate twice normal size, moderately firm and slightly tender, vesicles swollen the size of the little finger and very sensitive. No stricture. Smear of expressed fluid shows many pus and epithelial cells. Both smear and culture were negative for gonococci. Urinalysis: Amber, acid, 1014, no albumen, no sugar, few pus cells, no blood, no casts. Cystourethroscopy: Bladder and ureter openings normal, the veru is completely hidden by a papillomatous growth which is attached to the left lateral wall of the prostatic urethra, in front of the veru and extends backward through the internal meatus into the bladder.

The growth was fulgurated and when the patient returned in a week, only the small stump where it was attached remained. The veru can now be seen and is swollen and congested and the uterus masculinus is open. The patient's symptoms had about subsided. I again fulgurated the stump of the papilloma and the veru. In ten days nothing remained of the growth and the veru was much improved. The patient said he felt perfectly normal. He was instructed to continue his massages. On January 25, 1924, he came to see me merely to thank me again and report that he was entirely well.

Case 2. L. E. P. May 1, 1923. White, male, married. Aged thirty-eight. No history of venereal disease. Had infantile paralysis when

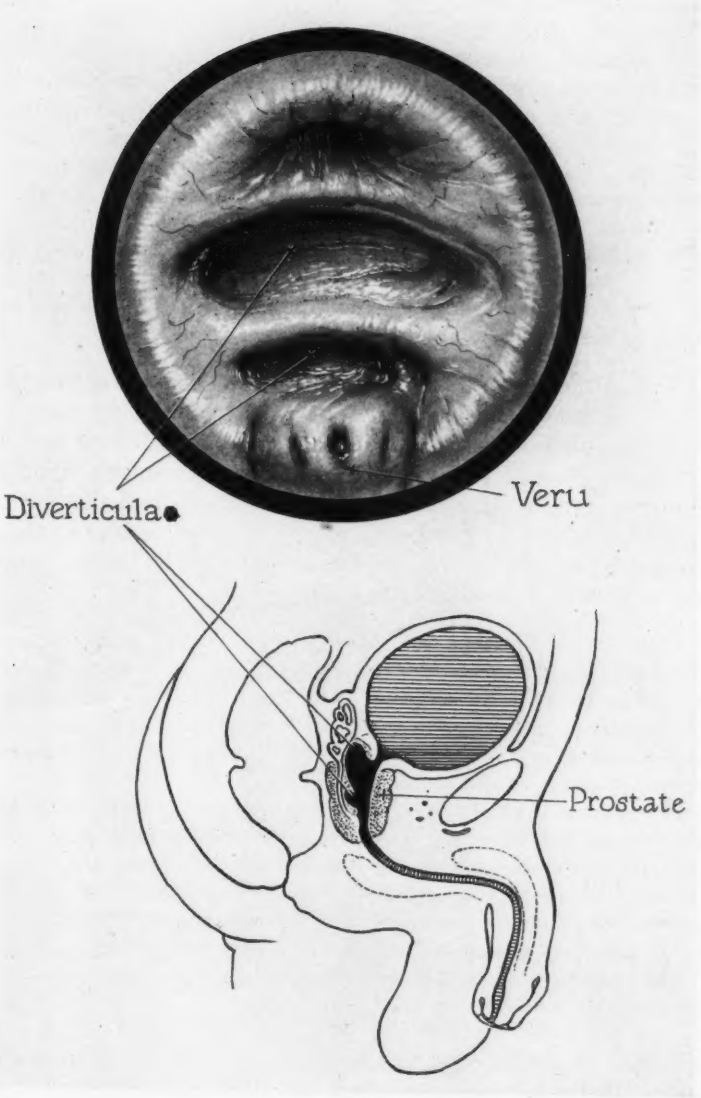
two years of age. Left leg much smaller and about 3 inches shorter than right. About two years ago he began experiencing some pain and difficulty in voiding. Later he had frequency, burning and tenesmus. During the past three weeks has had attacks of inability to void, but after straining and making great efforts for an hour or



CASE 1

more was finally able to empty his bladder. He has had no hematuria, but the urine has been cloudy at times.

Examination. Prostate somewhat enlarged, vesicles swollen and in perivesicular inflammatory mass. Cystourethroscopy; the bladder mucosa is slightly congested, ureter openings normal. There were two



CASE 2

edematous villi hanging in the internal meatus and attached to left side. These broke off during movements of cystoscope. The veru is swollen and congested. Behind the veru there is a large diverticulum, extending backward under the bladder neck and a small one in front of it.

Applications of nitrate of silver and dilations gave temporary relief but he returned in two months complaining as before. August 11, 1923, I fulgurated the interior of both diverticula and put in a retention catheter in the hope of keeping the fulgurated surfaces in contact in order that they might adhere, thus obliterating the cavities. The catheter was left in place ten days. After its removal he voided freely, easily and without pain or straining and has been entirely relieved ever since. On cystourethroscopy the diverticula are seen to have been practically obliterated.

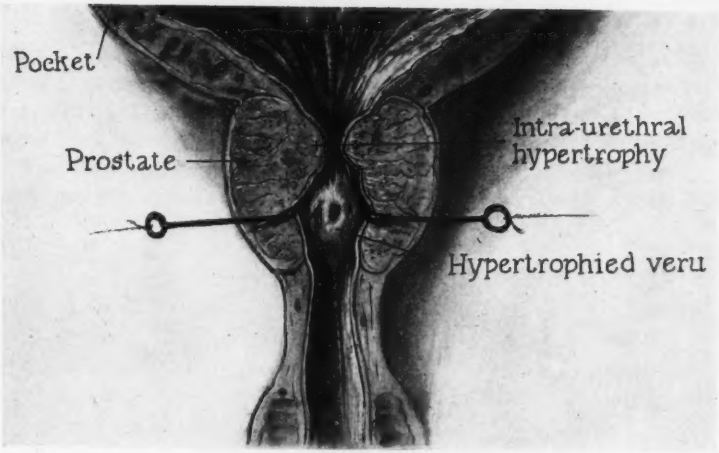
I am at a loss as to the etiology of the diverticula in this case. Watts classifies them as follows: (*a*) Congenital; (*b*) Acquired (1) from dilatation of the urethra due to (*a*) calculus and (*b*) stricture, (2) with perforation of the urethra resulting from (*a*) injuries to the urethra, (*b*) rupture of abscesses into the urethra and (*c*) rupture of cysts into the urethra. If this was a case of congenital diverticula, it is rather strange that he had no symptoms till two years before I saw him.

Case 3. T. C. K. December 12, 1923. White, male, married. Aged fifty-one. Had gonorrhea thirty years ago, no trouble till about a year ago when began having some frequency, burning and sense of obstruction on urination and has difficulty in completing the act. Has to get up once or twice at night to void. He has had no discharge or glueing together of the lips of the meatus.

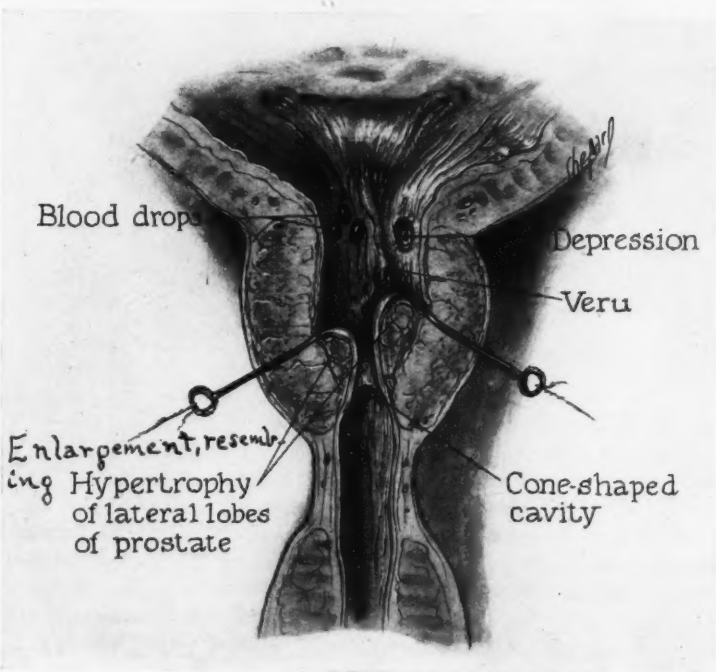
Examination. Prostate only slightly enlarged, vesicles palpable. There is no residual urine. On cystourethroscopy, the bladder shows some chronic cystitis; the ureter openings appear normal; the floor of the prostatic urethra is congested; there is some lateral lobe enlargement of the prostate and the veru is very large and gray in color, seeming to act as a valve against the lateral lobes of the prostate.

The prostatic floor and the veru were fulgurated and the patient has been entirely relieved ever since.

Case 4. R. E. C. February, 1924, white, male, single. Aged twenty-seven. Had gonorrhea three years ago, lasted two months. Was


Pocket
Prostate
Intra-urethral hypertrophy
Hypertrophied veru

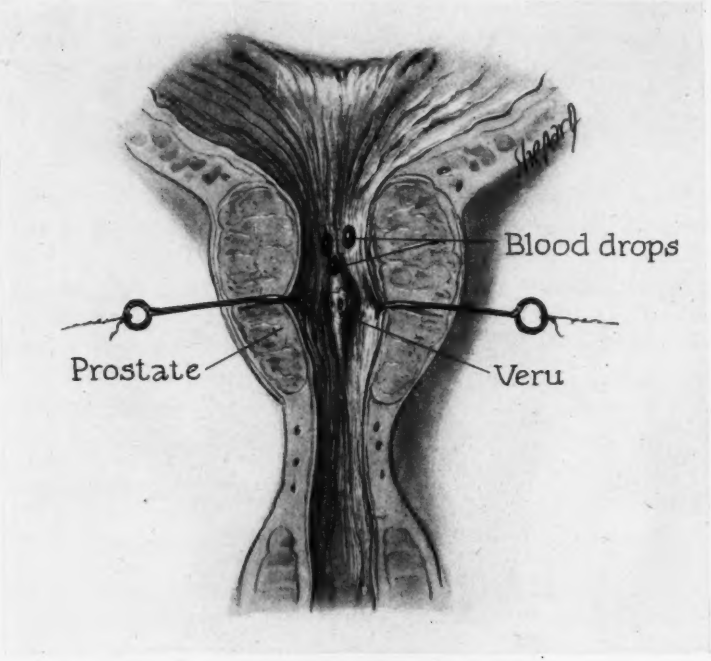
CASE 3


Blood drop
Depression
Veru
Enlargement, resembling Hypertrophy of lateral lobes of prostate
Cone-shaped cavity

CASE 4

told had a stricture and treated with sounds, massages and irrigations. Has frequency and burning on urination and some irritation in neck of bladder. Gets up several times at night to void and has frequent erections that annoy him especially at night.

Examination. Prostate two times normal; vesicles some what swollen and tender. Fluid expressed after massage shows a few pus and epi-



CASE 5

thelial cells, but no gonococci were found on smear or culture. There is no evidence of stricture. Cystourethroscopy: Shows slight congestion of trigone near internal meatus. After passing through internal meatus, there is quite marked congestion of floor of prostatic urethra and there are several "ecchymotic tears" on it. The veru is swollen, cone-shaped, congested and to left of median line. To the left of the veru is an opening the size of a pin head. Passing forward there is a

bulge on either side similar to lateral lobe hypertrophy with a cone-shaped depression between them in front.

Fulguration of prostatic floor and veru was done. He experienced great relief but despite continued treatment he still has some irritation and frequency.

CASE 6

Case 5. S. W. January, 1924. White, male, married. Aged forty-four. Had gonorrhea 1901. Lasted about four weeks. No symptoms till three weeks ago when began having premature ejaculations and failing erections. Has had frequent nocturnal emissions since. Has no urinary disturbance and never gets up at night to void. When straining at stool a mucoid discharge appears at the meatus. He is very nervous and complains of dizziness.

Examination. Prostate twice normal size, vesicles somewhat swollen, no stricture. Urinalysis: Negative except for a few pus cells. The expressed fluid following massage shows pus, a few spermatozoa and epithelial cells, but no gonococci. Cystourethroscopy: Bladder and ureters appear normal, some congestion and three "ecchymotic tears" on floor of prostatic urethra behind the veru. The veru is quite large, congested and irregular. The utricle is open and the ejaculatory ducts are not in line.

The ejaculatory ducts were catheterized, mercurochrome injected and the veru and prostatic floor fulgurated. He has improved very much but is still under treatment.

Case 6. E. P. W. May, 1921. White, male, single, Aged twenty-eight. Had gonorrhea three years ago. Lasted six months, had it again one year ago and has lasted ever since. Now has rather profuse, morning drop and for past three weeks has had some frequency and dysuria.

Examination. Prostate three times normal, vesicles swollen and in inflammatory mass. Expressed fluid following massage shows pus, spermatozoa, gonococci and colon bacilli. Cystourethroscopy: The prostatic floor is congested, the veru is swollen and bleeds easily, the utricle is gaping and to the left of the utricle a long narrow smooth papilloma is attached. The right ejaculatory duct is plainly visible, the left hidden by the papilloma.

The growth was fulgurated and in ten days had completely disappeared and the frequency discharge and dysuria were greatly relieved.

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CARCINOMA OF THE MALE URETHRA

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While primary carcinoma of the male urethra is undoubtedly a rare condition, and up to recent times only a few cases have been reported in the literature, it is probably not of such infrequent occurrence as this relative paucity of reported cases would lead us to infer. During the past five years several articles upon the subject have appeared, each incorporating what the author believed to be a full record of all previously reported cases, but when we come to compare these lists it will be noticed that they are by no means identical; and that one author will accept as an undoubted case of primary urethral carcinoma what the next, after an equally careful examination, will reject as unproved or doubtful.

Thus, Rizzi, writing at the beginning of 1921, is authority for the statement that Bosse, in 1895, could collect but 29 cases in the literature published between 1834 and his time of writing. Preiswerk, in 1907 found 39 cases, and Bierbaum in 1912, 49. To these Preiswerk added 2 cases published after Bierbaum's dissertation, and 1 of his own, making 52 in all. In the same year that Rizzi's article appeared in Germany, Richard F. O'Neil of Boston collected a list of 58 cases—some of which are not found in Rizzi's list—although, he too, based his collection upon Preiswerk's. Last year, however, Culver and Forster of Chicago produced 14 additional earlier cases which were not added to Preiswerk's, making, with the addition of his own, 80 so far reported. As Kretschmer does not give a table of his additional cases it is impossible to tell how closely his list corresponds with those of the previous authors. It is, however, safe to say that up to the present time at least 80 cases of primary carcinoma of the male urethra have been reported to which it is my purpose

to add 2 more—1 of my own and 1 of Dr. A. H. Paine, of Rochester, N. Y.

Author's case. C. W. A., lawyer, aged fifty-two years. Referred to me by Dr. E. V. Sweet, October 13, 1922, with the history that two months previously he had noted an urethral discharge which contained no gonococci and which failed to respond to ordinary treatment.

Three weeks before I saw him he noticed some blood in the discharge which had continued from time to time. There was slight burning on urination and he had been getting up once or twice at night to urinate. There was some increased frequency during the day and occasionally some difficulty. There had also been some pain in the left testicle.

The patient laid great stress on the fact that in June, 1922, on a fishing expedition he had ridden about 20 miles on the rear mud guard of a motor-cycle covered only by a small blanket. For several days after this he had some pain and soreness in the perineum and scrotum.

His previous history is interesting. About twenty years ago he had had an operation on the left side for varicocele. Approximately thirty years ago he began to have nocturnal epileptic seizures for which had taken small doses of bromide daily with good results. Five years ago he began to show unmistakable signs of hypo-thyroidism which improved rapidly under small doses of thyroid gland. The hypo-thyroidism was thought to be due to the long continued use of bromides.

He denied gonorrhea and syphilis.

Examination. There were large varicose veins on the left side of the scrotum extending down on to the perineum and to some extent on to the penis. These veins could be found in the scrotal sack as well—the whole amounting to an angioma. The right side of the scrotum was normal. Owing to the large mass of veins satisfactory examination of the left testicle was not possible. However, deep in the scrotum was felt a small, hard mass, slightly tender, about the size of a small walnut and which at this time was taken to be the epididymis. There were also large hemorrhoids which had bled profusely at times. The angiomatous condition he had always had. There was a profuse, rather foul urethral discharge which contained no gonoccocci. The prostate was normal by rectum, vesicles not felt. Wassermann was negative.

Examination of the urethra revealed an obstruction in the bulb to an 18 F. Bougie-a-boule. It was therefore thought from the history of trauma that a thrombo-phlebitis had produced a peri-urethritis with a resulting infiltration and possible stricture formation.

Patient was treated with sounds, irrigations and hand injections of silver iodide for the following three months—the largest sound used being 25 F. always accompanied by great pain. There was no improvement in his condition and urethroscopic examination was unsatisfactory owing to the profuse discharge and bleeding. He was seen in consultation with Dr. H. G. Bugbee of New York, who advised an external urethrotomy.

This was performed by me in February, 1923. A large abscess was opened by perineal incision which was apparently surrounding the urethra at the bulb and a 31 F. sound passed to the bladder after urethrotomy had been done. A tube was inserted into the bladder through the perineal incision and iodoform gauze packed around it. The gauze was removed in three days and the tube in five days. The wound continued fairly clean with some discharge and urine being passed through it. In about two weeks, however, the discharge ceased through the perineal wound and began to exude through the urethral meatus. The urine, however, continued through the perineal wound.

Patient left the Hospital in six weeks but was readmitted two weeks later for what was thought to be a reformation of the abscess underneath the scrotum. At this time he was again operated on and very little pus was found in a large cavity which was apparently surrounded by a thick, pyogenic membrane, rather firm in character, and which it was thought best not to disturb. Drainage was left in the wound and removed after a few days. Patient remained in the hospital but the wound which heretofore had remained fairly clean took on an appearance of excessive granulation from which a piece was incised and found to be squamous-cell carcinoma. Patient had several severe hemorrhages and died of exhaustion July 21, 1923.

Report of Dr. Paine's case. Seen September 22, 1922. Mr. T. D. P., aged fifty-five years.

Chief complaint. Difficulty in voiding.

Family history. Father died, aged fifty-five, cause unknown; Mother died, aged fifty-six, pluropneumonia; 3 brothers living and well; 1 brother, died at fifty-nine, rheumatism.

Personal history. Seven years ago, typhoid. Thirty-five years ago, gonorrhea. Was told he has strictures and had sounds passed at this time. Seven years ago, had strictures treated. Says urine passed easily and freely but has had frequency and nocturia through life.

History of present illness. May 10, had acute retention and since then has had frequent painful urination and much straining.

$$\frac{D \times Q \text{ } \frac{1}{2} \text{ to } 3 \text{ hours}}{N \times 15 - 20}$$

Examination. Palpation of urethra.—From anterior one-third of penile urethra back to peno-scrotal junction is a dense indurated area.

Exploration of urethra. Bougie-a-boule No. 16 finds a dense broad stricture from anterior one third penile urethra to 1 cm̄. posterior to peno-scrotal junction, and at compressor, another less dense and broad. There is resistance at internal vesical sphincter.

Cystoscopy. No. 18 close vision scope. Passes stricture in anterior urethra with difficulty and finds resistance again at internal sphincter. Bladder markedly trabeculated and seat of chronic cystitis. Ureteral ostia normal sphincter irregular and has adherent exudate. The floor is distinctly raised and viewed from urethral aspects forms a distinct shelf into urethra. Posterior urethra velvety, veru normal, pus exuding from all prostatic and ejaculatory ducts. Intrusion of right lateral prostatic lobe into urethra, but no prostatic intrusion into bladder. Epididymes: Both enlarged and hardened. Residual urine 250 cc. Seminal vesicles: Left, very large, smooth and tense; right, large, thickened and hardened. Prostate: Both lobes large, soft and regular in contour and consistance.

Operation. September 26, 1922. Suprapubic cystotomy. Marked fibrosis and contracture of internal sphincter. This grasped on floor with volsellum forceps and wedge-shaped piece excised with scissors. This exposed two small adenomatous lateral lobes which were enucleated.

October 15, 1922: Abscess developed at peno-scrotal junction. October 17: Abscess incised. October 27: Granulations protrude through urethral fistula at peno-scrotal junction. Cauterized. Sound passed. November 25: Fistula at peno-scrotal junction seems nearly closed. Sound passed. November 27: Discharged. Some urine leaks from incision at peno-scrotal junction.

Pathological report. Prostate, weight 18 grams. Diagnosis: Adenoma. Chronicprostatitis.

Second admittance, April 8, 1923.

Interval history. When leaving hospital patient was instructed to visit office to have urethral stricture at peno-scrotal junction dilated. After several dilitations upon withdrawal of sound some papillary tissue followed sound out of meatus. This proved to be carcinoma (two laboratories). He had been voiding normal urine. Small sinus persisted at peno-scrotal junction. General condition much improved.

Operation. April 9, 1923. Amputation of penis. An attempt was made to separate corpus spongiosum from corpora cavernosum which proved impractical on account of adhesions. Scrotum divided and penis amputated just anterior to bulb. Urethra implanted in perineum. Scrotal incision closed.

April 18: 60 mgm. radium—in capsule, three hours in urethra.

April 20: 60 mgm. radium—in capsule, two and one-half hours in urethra.

April 24: 60 mgm. radium—in capsule, three hours in urethra.

Pathological report. Urethra is covered in part by a flattened cauliflower of papillary neoplasm tending toward longitudinal rather than annular growth—sections show all tissues to be of same histological structure, viz., villous or papillary arrangement of carcinoma of urethra.

June 15, 1923: No. 26 F. sound. June 27, 1923: No. 26 F. sound. July 30, 1923: No. 26 F. sound tight in skin. December 1, 1923: Incision looks well. No. 26 F. sound passes easily. Gained 23 pounds.

One of the most interesting and scholarly articles on this subject is that written by Basil Hall, an English surgeon, in 1904, of whom, however, the much quoted Preiswerk makes no mention. Hall reported 1 case of his own and another of his colleague, Jason Wood, which occurred within a few weeks in the same Infirmary. This coincidence in the case of so rare a disease led Hall to make a digest of the literature which had previously appeared on the subject which he presented with these case reports and those of 2 others seen by W. P. Montgomery, another colleague, which had never before been published.

It is interesting to compare the conclusions of Hall with those of the American writers whose work appeared last year. Hall says:

In reviewing the symptoms of this disease, Beck (Internat. Clinics, vol. 11, 2nd series, 1892) wrote as follows: Primary cancer of the

urethra occurs in men over fifty who have most commonly suffered from some previous disease of the canal, usually gonorrheal stricture. The most prominent symptom is the gradual formation of a hard lobulated mass around the urethra. Micturition becomes increasingly difficult and is almost always painful, far more so than in simple structure. Hemorrhage especially before and after micturition is a common symptom. As the growth extends, the crura and corpora cavernosa become implicated and the disease advances past the scrotum into the penile portion of the urethra. The glands in the groin enlarge, and the patient becomes cachetic in appearance. The passage of instruments is from the beginning difficult, and is always followed by bleeding.

In the light of experience gained from a larger number of cases than Beck had had the opportunity of seeing, Hall feels that some of the enumerated symptoms cannot be relied on with certainty. In the cases observed by Wood, Griffiths and himself, there was a marked absence of pain and hemorrhage and in 2 of them instruments passed in to the bladder with great ease. Moreover, the amount of induration associated with simple stricture varies within wide limits. Hall, therefore, was "forced to the conclusion" that a differential diagnosis between malignant disease and simple induration is frequently impossible prior to operation, excepting when the size of the perineal swelling is out of all proportion to that usually, associated with simple stricture.

Unfortunately, the rarity of malignant disease in this situation is such that suspicion is not easily aroused under any circumstances. . . . . It is very necessary, therefore, always to bear in mind that such cases do occasionally occur, and whenever a patient presents himself for examination with a well marked perineal swelling the possibility of malignancy should be carefully considered.

O'Neil says:

Unfortunately the early symptoms are not characteristic of the malignant nature of the lesion and are generally such as would coincide with the ordinary urethral stricture. Urinary symptoms are often met with and increasing difficulty and frequency of micturition,

with or without attacks of acute retention. Hemorrhage from the urethra, and a purulent discharge occur. These, of course, are met with in ordinary stricture of the urethra. As the disease advances a swelling appears in the perineum simulating peri-urethral abscess or infiltration, and extravasation of urine. On incision, the true character of the lesion may be discovered, but not infrequently it is not until a second operation is undertaken for lack of closure of the fistula or relief of the supposed stricture after draining of an abscess, or the wound has taken on an appearance suggestive of malignant disease, and a section of tissue removed shows its true nature.

Syphilis is to be excluded by the Wassermann test and failure to respond to active treatment. The age of the patient is suggestive. The growth has in some cases been demonstrated by the urethroscope. . . . . The diagnosis from stricture with extravasation or fistulae is extremely difficult, and at times impossible without operation, and unfortunately the rarity of carcinoma is such that suspicion is not easily aroused. As a rule the perineal swelling is out of proportion to that seen in ordinary stricture, but here again this varies within wide limits. The "wooden" induration of the tissue about an old sinus may be very suggestive of malignancy.

According to Kretschmer, the "symptoms are practically nil" early in the course of the disease. Obstruction which the tumor within the lumen of the urethra produces, or other symptoms of stricture, are often those first noted by the patients. It may be the appearance of a discharge which first draws attention to his condition. Because of these early symptoms the clinical picture is often confused with stricture, and will be still more complicated if the patient develops complete retention of urine, after symptoms of urinary obstruction have been present for some time. That carcinoma may produce an obstruction which is a malignant stricture should be borne in mind in eliciting the history, particularly when trying to establish a history of previous strictures.

The second stage of the disease "may be characterized by the formation of a local tumor which may be the first symptom noted by the patient; hence, it is this condition which causes him to consult a physician. Tumor is a common finding later in the course of the diesase." In the third stage "infection supervenes,

and there is superimposed the picture of a peri-urethral abscess, which has, indeed, nothing characteristic about it to distinguish it from any other type of peri-urethral abscess. If a patient with this type of abscess is brought into the hospital as an emergency case, the malignant nature of the condition is often not recognized, and this oversight can be readily understood." Later on, the clinical picture is further complicated by the presence of fistulae, the openings being most commonly on the under-surface of the penis.

Comparing these three descriptions it will be seen that very little progress has been made in diagnosis in the last twenty years. Except for the better diagnostic technique in excluding the possibility of syphilis, Kretschmer, in 1923, is in no better position in this regard than was Hall in 1904.

The bulbous urethra seems to be the most common place of origin for the lesion. Peacock's case, reported in 1910, and that of Menard, which he published in the same year, both began in the penile urethra. When the lesion is located in that area the chances of relief by operation are somewhat better than in the other type. Peacock performed a partial amputation of the penis with good result, and in Menard's case the penis was amputated and the inguinal glands dissected.

Following Kretschmer's etiological classification, primary carcinoma of the male urethra may be divided: (1) squamous-cell carinoma; (2) columnar-cell carcinoma; (3) papillary carcinoma, and (4) adeno-carcinoma. He says:

> As the tumor enlarges the lumen of the urethra is encroached upon the symptoms of stricture supervene. At times it extends into the spongy bodies and not infrequently grows outward so that a palpable mass is present. Infection is a concomitant of the tumor; hence, suppuration ensues, and the clinical picture is that of a peri-urethral abscess. Later fistulae may form with the escape of urine through the fistulous openings.

The predisposing causes of urethral carcinoma are obscure. Culver and Forster mention that leucoplakia has been considered by some authors as important. Caruncle as a forerunner is

undoubtedly of considerable consequence, although mentioned in only about 10 per cent of the cases in literature. This, however, includes both male and female patients. O'Neil thinks the predisposing causes most commonly encountered are trauma, leucoplakia from chronic urethral irritation and stricture formation, this last being present in fully half the cases. The bulbous urethra is, as has been already noted, the most common location of the lesion and this is universally recognized as the most common site for stricture formation. Rizzi, in the analysis of the cases which he collected found that but 10 per cent had a history of trauma while in 60 per cent there was a history of previous gonococcic infection.

In regard to treatment the operative results in the collected reports are not in the least favorable or encouraging. Radium has not received much attention in the treatment of carcinoma of the urethra in the male, though some female patients have received radium treatment with marked benefit. Of Hall's 10 cases which were treated by excision in some form, the result was unknown in 1; 4 died within nine months; there was 1 recurrence within a half year; and in 4 there had been no recurrence in periods varying from four to twenty-one months.

Of the radical operations in the cases reported upon by Rizzi there were 4 immediate deaths; 5 recurrences within a half year; 13 cases which had not recurred for periods varying from six to ten months; and 3 patients who had remained well for three years or longer.

One great difficulty is the fact that the majority of cases reach the surgeon too late for anything but palliative treatment. In some of the earlier cases resection of the bulbous urethra has been attempted. Oberlander reports such a case where there was no recurrence for four and one-half years, but at the end of this time the growth reappeared in the prostatic urethra. O'Neil considers Hall's figures and comments that "the results are far from brilliant," but he is convinced nevertheless, that extirpation should be tried if the growth is diagnosed early. "Amputation of the penis has given good results in the early cases involving the penile portion of the urethra only."

Kretschmer is most emphatic in stating that "just as soon as the diagnosis has been made nothing short of a radical operation should be employed, namely, amputation of the penis with transplantation of the urethra and complete extirpation of the inguinal glands." This, he performed in his own case, and "when the patient was last heard from, two years after the operation, there were no signs of recurrence." This author suggests the use of radium in early cases, when the tumor is still small and there is no involvement of the regional lymph glands; and this is also the opinion of Culver and Forster, who say that "in operable cases, whether in the male or female, it seems logical to use both surgical measures and radium, or massive doses of the X-ray."

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SOME PHASES OF THE TREATMENT OF PROSTATIC CARCINOMA

B. S. BARRINGER

I. METHODS OF RADIUM TREATMENT

Both Young and Bumpus have, in their reported cases, attempted to and succeeded in confining the radium application to a carcinomatous prostate to one series of treatments, extending over at most a number of weeks. Their treatment has been rectal, intra-prostatic, by needles, and intra-urethral. In this way, 1900 to 2500, and even 4000 or 5000 mgm. hours, have been given within a short space of time—weeks. Our routine at the Memorial Hospital is perhaps no better, but certainly quite different. We give the radium by needles introduced through the perineum, placing the needles 2 to 3 cm. apart throughout the carcinomatous prostate, and passing other needles up into the seminal vesicles. These latter are sometimes introduced through the rectum, and so into the seminal vesicles, the angle of introduction being often better through the rectum. The dosage varies with the size of the tumor, but at one sitting rarely more than 800 mc. hours are given, and generally less. If there is urethral invasion, screened radium (silver 0.5 mm.) is used in the catheter, the dose being about 200 mc. hours. Bare tubes of radium are not used in the prostate, as they cause undesirable slough and pain.

No other treatment is given from two to three months. A slow sclerosis of the carcinoma goes on during this period. The patient, instead of having to go through a period of recovery from his radium treatment, which seems to us inevitable when the larger doses are given, is encouraged to get stronger, to excerise, so stimulating the production of any natural barriers he may have within him. And this last is very far from a theoretical considera-

tion. Many patients, if they live long enough, seem to reach a more or less stable condition, as far as their cancer is concerned, and improve in health and strength. Every two or three months, for several treatments, radium is repeated until in cases which react well, the prostate is a sclerosed mass. Such cases, we all know, are only too rare.

Recognizing the low percentage of actual cures by radium or operation of carcinoma of the prostate, it would seem as if this gentler and more occasional treatment were better.

II. URINARY OBSTRUCTION IN ADVANCED CASES

One of the most interesting problems of prostatic carcinoma is the management of urinary retention in cases in which the growth is extensive. These patients have a short lease of life, at most two or three years, and living may have become intolerable to them, because of the frequent and painful urination, or the impossibility of urinating at all. In such cases a major operation is to be avoided, if possible. Radium rarely helps retention. Young has employed the Bottini operation in four such cases, with distinct palliation of symptoms. We have employed an even simpler method. The Young punch instrument has been modified, the length of the opening in the instrument made three times the original size. In this way a much larger piece can be punched out of the bladder neck. We routinely make 3 or 4 punches of the lower part of the bladder neck. This operation has been used in 13 cases. The average age of patients operated upon was sixty-two years, the oldest seventy-five, and the youngest fifty-two years. Residual urine varied from 60 cc. to complete retention. In 12 cases the residual urine diminished, and in 1 case did not. In 4 of the 12 cases the operation reduced the residual respectively from 90, 120, 120 and 210 cc., to none. The operation seems to work best where there is complete retention. In 4 such cases the residual fell, in 1 case to nothing; in 1 to 15 cc., and in 2 to 60 cc. There were 4 other cases in which the residual was cut in half, but the patients still retained enough urine to cause frequency, and in most cases, painful urination. Therefore, the operation succeeded in 8 of

the 13 cases, 61.6 per cent, and failed in 5 of 13 cases 38.4 per cent. When it does fail, I believe the only thing left is permanent suprapubic drainage.

Duration of life after operation

One died in sixteen days from uremia; the operation undoubtedly hastened his death. Two died in five months, 1 died in seven months, 1 in eight months, 1 in twelve months, 1 in thirteen months. Six are still living. Four for five, nine, thirteen and eighteen months postoperation, and 2 are recent cases.

Pathology

In 12 cases the examination of the removed specimen showed carcinoma in 11. In 1, normal prostatic tissue. One of the cases showed an epidermoid carcinoma of the bladder, with a primary lesion, with a prostatic carcinoma secondary.

III. CONTROL OF PROSTATIC CARCINOMA BY RADIUM

From October, 1915, to January, 1917, we saw 46 cases of prostatic carcinoma at the Memorial Hospital. In but 1 of these cases was the carcinoma confined to the prostate. Five of these 46 cases lived more than five years. In none of these 5 cases, when last seen, was there any gross evidence of active carcinoma. Therefore in 11 per cent of this first series was the carcinoma controlled, and possibly cured. We see at the Memorial Hospital very few cases in which the carcinoma is confined to the prostate —2 per cent according to our records. I believe that our later records of controlled cases are not quite as good as this first series. It seems conservative to say that with radium treatment from 5 to 10 per cent of cases of carcinoma of the prostate may be indefinitely controlled.

A short résumé of these 5 cases is of interest:

Case 1. J. D., aged fifty-seven, first seen October 15, 1915, carcinoma of prostate, extending somewhat beyond prostate. Diagnosis with Dr. Keyes. No specimen. Treated only with radium needles, 4 times at intervals of about three months each. In perfect health five years and three months after first seen, then lost track of.

Case 2. A. S., aged sixty-six, first seen October 10, 1916, prostatectomy by Dr. Keyes. Pathological examination showed carcinoma of low malignancy. Treated only with radium needles 3 times. Five years later developed urethro-rectal fistula from radium needle; well, barring this, seven years after first seen.

Case 3. M. P., aged sixty-four, first seen April 2, 1917. Prostatectomy by Dr. Downes, at St. Luke's Hospital, January, 1916. Pathology showed carcinoma. Seen one year after operation with nearly complete obstruction at bladder neck. Treated only with radium needles in prostate 3 times, and dilatation. Six and one-half years later is well, barring ½ to 2 ounces residual urine.

Case 4. J. H., aged fifty-five, first seen July, 1917, hard and irregular carcinoma, left lobe around into left vesicle. Diagnosis with Dr. Keyes. No specimen. Treated twice with radium needles. Well, three years and six months later.

Case 5. J. C., aged seventy, first seen February, 1916. Early case, with some question of diagnosis. Diagnosed by Dr. Keyes as carcinoma. Dr. Beer questionable. Later examination because of enlargement around seminal vesicles, and diagnosis seemed to be assured. His first symptom was a complete retention of urine. Treated only with radium needles in prostate twice. Well seven years and nine months after first seen. No recurrence of retention.

IV. BONE METASTASES IN CARCINOMA OF THE PROSTATE

I have reviewed the radiographs in 44 cases of extensive carcinoma of the prostate. The radiographs taken were as follows:

	Number of cases
Lumbar spine, pelvis, upper end femur	39
Lumbar spine, pelvis, upper end femur and dorsal spine	1
Lumbar spine, pelvis, upper end femur and chest	2
Lumbar spine, pelvis, upper end femur, dorsal spine and chest	1
All bones and chest	1

There was metastases as follows:

	Number of cases	*Per cent*
No metastases	32	72.7
Metastases	10	22.7
Suggests metastases	2	4.5

This percentage of metastases very well agrees with Bumpus's figures.

The situation of metastases was as follows:

	Number of cases
Lumbar spine and pelvis	10
Dorsal spine	1
Hilum, lungs and lumbo-sacral spine	1

In most of the cases the metastases was of the sclerosing hyperplastic or productive type, so different from that so often seen in bladder carcinoma, the rarifying type. In 11 cases there were shown hypertrophic, osteo-arthritis. In 2 of these 11 cases the carcinomatous metastases were shown.

It is our routine at the Memorial Hospital to take a radiograph of the lumbo-sacral spine, pelvis, and upper femur, unless there is a special indication to take other regions. This as a rule will show the metastases, if they be present. On the other hand, in one of the above cases the metastatic growth was in the 5th dorsal vertebrae alone. In this case we would have missed it.

V. DIAGNOSTIC NEEDLE

The original needle devised at the Memorial Hospital is somewhat smaller than the one now used. If the present needle is well taken care of, and is sharp, we can get a specimen, of the prostate in practically every case. The needle is routinely used in cases in which the diagnosis is in question. It has been of value not only in diagnosing carcinoma, but in differentiating tuberculosis of the prostate from simple prostatitis.

During the past week we have had 2 cases in neither of which did I believe carcinoma to be present. I was simply suspicious that it might be. With the diagnostic needle, a specimen was obtained and a diagnosis of carcinoma was made in both cases. These are the 2 earliest cases we have seen in six months.

SUMMARY

The best method of treatment in our hands has been by radium needles inserted into the prostate and seminal vesicles, this re-

peated every two or three months until sclerosis of the carcinoma occurs. If there is urethral invasion, urethral treatment is added, to the needle treatment. The modified punch operation has been used in 13 cases of extensive prostatic carcinoma to overcome urinary retention. It was used successfully in 61.6 per cent cases, and failed in 38.4 per cent. Five cases out of the first 46 seen have gone more than 5 years with the carcinoma apparently under complete control. All of these cases were treated solely by radium needles.

In from 5 to 10 per cent of cases, the carcinoma ought to be controlled by radium. Bone metastases occur in our cases in 27 per cent.

The diagnostic needle developed at the Memorial Hospital enables us to make an accurate diagnosis in a larger percentage of early cases, and is used routinely in the diagnoses in question.

DISCUSSION

Dr. J. Dellinger Barney (Boston): I would like to speak about Dr. Laurie's paper. It has been my good fortune to have four such cases under my care. Two of these I saw about twenty years ago when I was a house surgeon; and another about three years ago, and a fourth within the last month. The three earlier cases were in men past middle life and the symptoms were those of stricture of the urethra, and that diagnosis was made. Perineal section showed necrosis with indurated brawny tissue which looked not unlike inflammatory tissue, but at a subsequent operation, the diagnosis of carcinoma was made by the pathologist.

The recent case was a man of sixty who had symptoms of stricture. His urethra was contracted down until only a small bougie could be passed into it. He had a smooth, hard swelling in the perineum in the median line. I did a perineal section, supposing we were dealing with stricture, but I noticed as I went down to the urethra that in addition to the general infiltration there were areas of peculiar looking yellowish tissue. I had suggested carcinoma among the other diagnoses before operation. On seeing this tissue I suspected it was carcinoma and took out specimens, but the pathologist's report was chronic inflammatory tissue. The patient made a good recovery from the operation, but the wound did not heal satisfactorily and there was a good deal of discharge of urine from the perineum. So another operation was done in which a lot more tissue was excised. The pathologist then reported squamous cell carcinoma. The man is failing fast and apparently has metastases.

These cases are so frequently mistaken for simple stricture with long standing inflammatory prostatitis, that it is almost impossible to make a diagnosis before operation. But having seen one or two, one is always led to think of carcinoma as a tentative diagnosis.

Dr. JAMES PEDERSEN (New York) : I think Dr. Livermore may be complimented on having called attention to this interesting series of cases which show somewhat more extensive lesions than we usually see. I am glad that he called attention to the advantages of fulguration as opposed to silver nitrate applications.

Dr. Barringer's paper leads me to speak of a case of carcinoma of the prostate which has come under my care. This patient in question was very efficiently treated at Johns Hopkins by radium introduced through the urethra and also through the rectum. That was three years ago. After the course was finished he suffered a great deal of urethral and prostatic irritation and pain, according to his history; also a severe epididymitis. But the treatment enabled him to empty his bladder again, and he remained comfortable for two years. About a year or eighteen months ago, he reported again with retention of urine. He now has persistent total retention and is dependent on the catheter. Every few months an obstruction occurs and he cannot pass the catheter.

It has become necessary to pass a sound once in two or three weeks to avoid these attacks of occlusion. The rectum shows a good deal of scarring and he suffers a certain amount of rectal discomfort. The prostatic condition is a fibrosis.

Possibly this patient's case belongs to the class mentioned by Dr. Barringer, and will be benefited by the punch operation.

Dr. GEORGE G. SMITH (Boston): I would like to say a word about treatment of cancer of the prostate. I feel that Dr. Barringer's paper has given us a great many good points in regard to the radium treatment of this condition, but it seems to me there is a distinct group of cases which can best be treated by the radical operation described by Hugh Young. At this Society last year I read a paper mentioning five or six such cases which I had treated, and since then I have had at least four more. There was no operative mortality. All cases had practically perfect control afterwards. There would be a slight dribbling on coughing or on suddenly jumping up, but their control was so good that none of them needed to wear a urinal.

The cases which should be handled in that way are those in which there is a definite sulcus around the prostate. The indurations may extend into the vesicles and in all of these cases I think it is best to remove the vesicles also. The cases are cystoscoped before operation with a view to determining whether there is any extension of the growth into the trigone, and if that has ocurred we do not consider them suitable for any operation at all. All of these cases were free from trigonal infiltration except the first one which I did about two and a half years ago. He was a man with a bladder up to the umbilicus, and with a bad heart. I saw him two months ago and he was in good condition. He had had a hard nodule on one side of the place where the prostate was which seemed to me was possibly malignant, so we treated him with radium and had him given treatment with the X-ray. In fact, I have recently had all these cases treated that way. It seems to me there is a distinct field for that operation and the results have been most gratifying.

In regard to X-ray treatment, I have been interested in following a few cases treated that way that were not suitable for radical removal. At the Hungtington Hospital we have been treating a few cases by the X-ray. One case we cystoscoped before his treatment and saw a couple of definite nodules on the trigone. The picture was very clear—they were definite nodules. About three months after his treatment cystoscopy showed these nodules almost entirely gone. Where one was there was a small ulceration. That encouraged me to believe that this deep X-ray therapy really has a distinct value and an ability to get at carcinoma cells even in the midst of the pelvis.

I would like to ask Dr. Barringer if he has noted any diminution in the pain resulting from metastasis as a result of deep X-ray therapy. Members of the Huntington Memorial Staff are certain they have had such results. This fact would warrant the use of the deep therapy as a palliative measure.

Dr. H. C. Bumpus (Rochester, Minn.): I am very much interested in Dr. Barringer's paper. We have tried to give all our radium exposure at a single visit. First, because the nature of

our clientele makes multiple visits difficult and second because the fibrosis and sclerosis which result after an initial treatment frequently render absorption following subsequent exposures inadequate. This results in so lessening the blood supply that sloughs and fistulae results. It also seems illogical to permit malignancy to progress, awaiting a subsequent treatment if the same amount of exposure can be given initially and I believe it can if no single area is over exposed.

There is a tendency in malignant disease to ascribe to the treatment employed all so-called five-year cases. We have noted in going over several different series of untreated cases that invariably 2 or 3 per cent lived over five years. Therefore a considerable number must have lived over this period to be convincing.

The subject of cancer of the prostate seemed summarized for me the day before I left Rochester when Dr. C. H. Mayo, asking that I visit an out-of-town patient said, "this man has a cancer of the prostate so no matter what you do it will be wrong."

Dr. WILLIAM F. BRAASCH (Rochester, Minn.): The roentgenographic demonstration of diffuse metastasis in the pelvic bones secondary to carcinoma of the prostate gland occurs frequently here no clinical data are present to indicate it. While the roentgenographic evidence of mestastasis is usually unmistakable, nevertheless there are many cases where it is difficult to make a positive diagnosis of metastasis. There may be a mottling of the bones present in areas which are occasionally observed with conditions other than malignancy. Furthermore, technical errors are also occasionally responsible for error. In cases of doubt a conservative interpretation is necessary.

Attention should be called again to the value of a careful search in case of malignancy in the lower urinary tract for the so-called "sentinel" glands. A patient was recently observed who had been referred because of supposed Hodgkin's disease. There were no urinary symptoms whatever. On physical examination several enlarged typmphatic glands were palpable in both cervical areas. On rectal examination an extensive carcinoma of the prostate was found. Biopsy of the cervical gland showed

carcinoma. Recently another patient was observed with carcinoma of the bladder with the sentinel glands in the neck and no evidence of metastasis elsewhere.

The rarity with which we find true papilloma of the prostatic prostatic urethra should be emphasized. Papillomata are frequently observed situated in the area of the internal sphincter, but it is rarely that their base has its origin in the urethral side of the sphincter. No infrequently the top of the tumor will flap over into the urethra, giving the appearance of having its origin there.

In the interpretation of lesions in the urethra as seen through the indirect vision urethroscope, it is sometimes forgotten that the lens magnifies the tissues. Recognition of this factor would probably reduce the number of papillomata and other lesions in the urethra which have been graphically described. I do not wish to infer that Dr. Livermore did so, and I am sure that the lesions he described are correct. It should be stated, however, that many tumors of the urethra, as well as diverticula, disappear when viewed with direct vision.

A factor which is sometimes overlooked is obstruction to the urethra from the overlapping type of bilateral prostatic hypertrophy. On cystoscopy there is no evidence of intravesical prostatic obstruction, but with the direct vision cystoscope the two lateral lobes will be seen to overlap so as to cause definite urinary obstruction.

Dr. JOHN CUNNINGHAM (Boston): It seems to me this Society and the profession at large, owes a debt of appreciation to Dr. Barringer for, from time to time, bringing the results of his Clinic before them. I have been much interested in listening to his report of cases with carcinoma of the prostate. As I interpret his report I cannot see that we are today in any better position than a few years ago in regard to obtaining favorable results in carcinoma of the prostate. I cannot help but feel that the secret in occasional favorable cases, which we all have probably observed, depends upon the type of pathology.

If we could have some means of classifying our pathology I believe we would then have some definite idea as to what our results might be, and could differentiate the type of the disease which might be expected to do well with radium, and the type or types which would not.

I have, for the past few years, treated these cases of prostatic carcinoma with radium alone, or as an adjunct to surgery, without any idea as to the type of pathology, whether rapid or slow growing, and in many instances without positive evidence of the presence or absence of metastases. In spite of the treatment of the local disease by radium and surgery alone or combined, most of our patients have died from metastases, rather than renal insufficiency, in those instances where the prostatic obstruction has been relieved.

The urinary retention has been dealt with by various surgical measures because, in our experience, but a few of the patients have been improved in regard to residual urine by radium alone.

Dr. Bumpus had remarked that "no matter what we do it will be wrong," as a basis of truth so far as a cure is concerned, and any form of treatment today, with rare exceptions, must be considered palliative in nature. From a palliative standpoint we have had some favorable cases treated by surgery and radium, and by radium alone, as far as relieving the urinary difficulties, produced by obstruction, is concerned.

One patient, with 18 ounces of residual urine, due to a large prostatic carcinoma and with demonstrable metastases in his spine, long bones and lungs, was the most striking example of local benefit from radium alone. With one treatment of 100 mc. hours of needling the prostate shrunk to essentially normal size, and the residual urine was entirely overcome. This is the only patient I have seen where retention was overcome by the use of radium alone. The patient died many months later from metastases.

We have had some cases upon which we have operated by radical procedures. When operation has been undertaken to relieve retention we have done either a partial operation, cutting away the obstruction at the bladder outlet with the punch, or the radi-

cal operation as advocated by Young and that advocated by Geraghty. We have been able, in some instances to eradicate the disease locally by these radical procedures, and believe that the technique advocated by Dr. Geraghty is better than that of Young because of the preservation of the vesical sphincter.

The ultimate result, however, of our cases of carcinoma of the prostate are bad, by whatever method of treatment, and we have found that the cases which have had a permanent suprapubic fistula established to relieve obstruction, have, on the whole, with associated treatment of the gland by radium, have lived longer than when any radical or palliative operation has been undertaken.

I am convinced that if tissue could be obtained preoperative, by the needle advocated by Dr. Barringer, or by some other device, and a histological study of this tissue is general, employed, and our pathologists will have some unanimity of opinion in regard to the classification of such tissue specimen, we may then have the ability to make some decision as to those cases which may have a favorable outlook, and those which will not . Until this is accomplished, I think we have no basis upon which to advance our knowledge or treatment.

My plea, at this time, is to attempt to place the matter on a fundamental basis by pathological classification without which it seems to me, we will remain in the same position as we are at present.

Dr. GILBERT J. THOMAS (Minneapolis): I was glad to hear Dr. Barringer's paper, and Dr. Livermore's. I reported yesterday in my paper on "spontaneous hemorrhage from the urinary bladder," a papilloma of the urethra which I though was secondary to one I had operated upon in the bladder. In the cases I have seen similar to those reported by Dr. Livermore there is congestion of the veru, and in a great number of these people if the ureters are catheterized, we will find that the lower urinary tract infection is a part of a general urinary infection. We always lavage the kidney pelvis as well as massage the vesicles and prostate.

Concerning carcinoma of the prostate, if one reviews a large series of what were thought to be non-malignant adenomas, 2 or 3 per cent of malignancy will be found, that were overlooked during the first pathological examination.

My experience with metastases from carcinoma of the prostate had been unusual, which illustrates the point that an individual can have carcinoma of the prostate and not have urinary symptoms. A man of forty-six a locomotive engineer, complained to his physician in Chicago that he had a pain in his shoulder on the right side, particularly when the arm was extended. This continued without improvement under the usual palliative treatment, and finally he consulted a neurologist, who got busy and rayed the spine and found what he thought was destruction from a malignant condition of the spine. The doctor immediately suspected the prostate and was able after rectal palpation to satisfy himself that carcinoma was present. This man had no urinary symptoms, and was only forty-six years of age. He later developed a second metastasis lower in the spine which paralyzed him.

My second experience with metastasis occurred with a patient in whom I was asked to pass a sound because a surgeon had attempted to do so and failed. Whether the surgeon had attempted to remove the prostate or not I do not know, but this man had carcinoma. In attempting to pass the sound I found difficulty. I gave the patient gas, and as you know in any urologic procedure where a man has to have a sound passed they do not take gas well. The surgeon held his right arm rather forcibly and I finally passed the sound, but the next day the arm was fractured because of this handling.

I think Dr. Barringer has indicated that we are making progress in the treatment of carcinoma of the prostate and certainly we will make progress in diagnosis if we all use the diagnostic needle in suspicious cases.

Dr. HENRY G. BUGBEE (New York): I feel that one of the most important phases of a meeting such as this is that we shall give our experiences in dealing with our most trying problems, and the most

trying problem we have in urology is probably carcinoma of the prostate. I believe as Dr. Barringer has said that the question is one of slow malignancy and rapid malignancy. In cases of slow malignancy we have been encouraged with the results we have obtained in a few cases. Apparently slow malignancy is rare in carcinoma of the prostate. Where it does exist we know treatment will allow the patient to go on in a comparatively comfortable state for a number of years. If we apply radium the growth seems to respond readily. I have three such cases where the growth was localized in the prostate and they have gone from three to five years apparently free from disease. I examine them every six months. In addition to these three I only have two going back five years. One of these is now beginning to develop metastasis.

When we first began to use radium we noticed a softening of the gland, but as we have gone on treating our cases we feel sometimes that we have made very little progress. We have removed the gland in some cases, but cases that respond to removal of the gland are the type that will respond to radium also. In very extensive cases we believe that we give the patient more comfort with permanent suprapubic drainage. In very extensive cases with a growth involving the vesicles you are apt with treatment to give the patient a toxaemia and lower his resistance, and it seems to me the only humane thing to do is to give relief by means of permanent suprapubic drainage.

Dr. FRANCIS R. HAGNER (Washington, D. C.): I think we have been very fortunate to have had this paper by Dr. Barringer and the discussion which has followed.

Personally, I believe that the cases in which we are able to make diagnosis by palpation and examination of prostatic cancer, are beyond any operative cure. The type of cancer of the prostate which we feel are less liable to have metastases are the small type and yet we know that the metastasis is greater in this than in the larger type. We know from cancer in other organs that none of these cases live five years if they have any gland involvement at all; also that in cancer of the prostate probably fairly

early the glands of the pelvis become involved. My own opinion is that these cases will live longer if you do not operate. Give them radium and palliative measures, but do not attempt any radical removal or any operation unless forced to do so by obstructive symptoms. That is the rule I have followed and I feel it is a safe rule in these cases.

Dr. A. J. CROWELL (Charlotte, N. C.): I would like to hear Dr. Barringer's idea about deep therapy in carcinoma of the prostate gland. The more I study malignancy in it the more I am bewildered. I have gotten brilliant results by operating in some cases, in using radium and X-ray in others and occasionally have wondered if they would not have been better off if they had been left alone.

Dr. Braasch's report of metastases in the sub-maxillary glands recalls a case which came under our care six or seven years ago. He had a very large nodular and definitely fixed prostate with marked hematuria when he came under our care. Both inguinal and submaxillary glands were greatly enlarged and the patient was greatly emaciated. He apparently was beyond any possibility of being benefited by operation and was referred to the X-ray department where not only the prostate was rayed but also the inguinal glands and the glands of the neck. He was kept under observation for about twelve months and referred back for examination. At that time the prostate was soft and freely moveable, had reduced about one fourth in size and felt almost like an oedematous hypertrophy. The inguinal glands and those of the neck appeared about normal and his general condition was such that we felt justified in operating to remove the obstructive symptoms produced by the prostate. The gland was removed and our diagnosis of carcinoma was confirmed microscopically. The patient is living and apparently in good health. There is no history of syphilis in this case and his blood Wassermann was negative.

This is the most brilliant result I have ever obtained in malignancy of the prostate and I am almost unprepared to believe what I have seen with my own eyes in this case. The more I study malignancy the more I am puzzled.

Dr. RICHARD F. O'NEIL (Boston): Dr. Laurie's paper recalls a case which I reported before the Urological Association in 1920, of extensive primary carcinoma of the urethra in a woman. The process was extensive involving the tissues under the trigone as well as the urethra. Operation was not advised. She was treated with radium with very unsatisfactory results. Death occurred from cachexia about nine months later.

In another case occurring in a male, the diagnosis was not made until the second operation for a supposed stricture of the urethra was performed, the first operation being an incision for an abscess in the perineum.

Dr. GEORGE R. LIVERMORE (closing): Dr. Braasch spoke of the rarity of papilloma of the prostatic urethra. It is a rare condition, but recently Davis of Kansas City reported a case in Surgery, Gynecology and Obstetrics.

In regard to Dr. Thomas' remarks about infection coming down from above, I brought out the point that often these pathological conditions of the prostate are due to infection higher up.

I would like to speak of the paper I read last year in which I promised to have microphotographs made. Unfortunately the sections were lost in transmitting from the laboratory to the place they were to be made. They did get to Chicago, however, and one was taken by Dr. Kretschmer to the Presbyterian Hospital. The pathologists examined it and made a diagnosis of epithelioma—which had been made by the pathologist at home. That is my apology for not having the microphotographs published in the transactions.

Dr. BENJAMIN S. BARRINGER (closing): In a recent discussion Dr. Ewing said that if we had never cured a case at the Memorial Hospital in the last ten years, our work would be well worth while for what we have learned about the variations of different tumors, their gross pathology and their life history. I think that is so in this Association. I think the discussions we have had today show that we have been slowly learning something about prostatic carcinoma, and that is surely worth while.

As to operation for prostatic carcinoma, which Dr. Smith brought up, he and Young and others have done brilliant work in that line, I have tried to keep on the other side of the fence and see if we could not get away from operation as much as possible in these cases, and I am glad that Dr. Hagner backs me up. Of course I think our views are changed by the individual success we have in individual cases.

Deep X-ray therapy has been extremely disappointing in its results in various ways. In the first place, in diminishing or contracting the carcinoma in any way. We have not given it to all cases routinely; but in no case have we been able to prove that it has been of advantage. Perhaps we do not give it right, but in most cases we are not able to control the pain. The only cases that have been benefited are not carcinoma of the prostate, but sarcoma. I remember one case or prostatic sarcoma treated by deep X-ray that has been controlled for over two years. When you see cases that live a long time without treatment, when they gain weight, the tumor goes down and the patient can go about his work for five or six years, we consider it controlled.

I was interested in what Dr. Braasch said about the sentinel glands, another thing that is so often overlooked. The first case I saw the house physician called me because he thought the prostate was slightly enlarged and irregular. The patient's chief complaint was a bunch of carcinomatous glands in his neck. At the autopsy of that patient we found a complete lymph chain of carcinoma, extending from his prostate to his left neck.

I entirely agree with Dr. Cunningham that one of the most important things is to get these cases early. It strikes me that in my hands this needle has been the best way of getting them early. Of course if you could take every man after 55 and examine his prostate it would be easy, but that is impracticable.

I would like to speak of Dr. Laurie's paper. We have had several cases of carcinoma of the urethra, and in most cases we have been unable to get specimens. They are of the sclerosing type and we cannot expect help from radium; and they have

been beyond operative treatment. The only type in which we have had any results are those that are secondary to carcinoma of the prostate or bladder. We have had several of these that have been controlled for some time by radium.

STERILITY IN THE MALE, WITH REMARKS ON OPERATIVE EXPERIENCE

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The subject of sterility, whether it is in the male, or female, is of such importance both to the family and the state that it has received the attentive consideration of both gynecologists and genito-urinary surgeons. It is only in recent years that the male member of the union has been carefully studied. Before this time the female received almost the entire attention of the profession. The operative treatment of anastomosis of the vas and the head of the epididymis as reported by Martin of Philadelphia gave an impetus to the consideration of the male as a factor in childless marriages. We have had patients where the woman has been subjected to all forms of treatments and operations—where careful examination proved not the woman but the man, to be the sterile party, and after operative treatment of him and the return of spermatozoa, from 1 to 5 children have blest a union that before had been fruitless.

In my own experience I have never seen a patient who was sterile from gonorrheal epididymitis who had impotency. From the records I have been able to find the frequency of childless marriages is caused by the male in about 1 in 6. However some authorities give a much higher percentage (Grose in 192 cases found the male deficient in 18 per cent).

We realize that there are other causes of sterility than gonorrheal epididymitis. I have taken up this side of the question in a paper in 1910 and as I am sure that this body is familiar with these causes I will not mention them further than to say that in gumma of the testicle, even where there is enormous enlargement of both testicles, after treatment these patients have not been

sterile. I have one case in mind that occurred sixteen years ago. He had bilateral gumma making a mass almost as large as a man's head that cleared up following treatment. An examination following the disappearance of the gumma showed normal spermatozoa and he has since had 7 children.

From our own experience I can say that bilateral gonorrheal epididymitis is surely the principal cause of sterility in men. Statistics show that traumatic epididymitis, unless very severe, rarely leads to sterility. Orchitis probably rarely, if ever, occurs in gonorrheal infections. I say this from our experience in the operative treatment of gonorrheal epididymitis. In a series of considerably over 200 we have never found evidence of involvement of the testicle itself, the epididymis and tunica-vaginalis seeming to bear the brunt of this infection.

In our earlier cases we followed the technique devised by Martin, but of later years we have felt it was better to open the tunica vaginalis, exposing the entire epididymis, as from this approach we were better able on inspection to pick out the portion of the globus major richest in tubules thereby facilitating the discovery of the portion that may contain live spermatozoa. On opening the vas we used to inject argyrol to be sure that the vas was patulous. We have discontinued this technique as we have felt it was important to keep all foreign substances that might tend to cause cicatrization away from the field of operation. We now use the finest tear-duct probe to be sure we are in the lumen, following this with a smooth strand of silkworm gut, which can in the unobstructed vas be passed from 16 to 20 cm. When we have done this we feel reasonably sure that the vas is patulous. If it is obstructed beyond this point there is no hope of an operative cure. After this examination has been made we pick out a likely looking place in the epididymis, cutting out an eliptical piece. If live spermatozoa are present, a milky fluid is usually obtained as soon as the section is removed. The fluid is then examined on a warm slide, the presence and motility of the spermatozoa being noted. If no spermatozoa are found this incision is closed with a cat gut suture. Another place is selected and the same procedure followed.

We have tried several types of suture, very fine cat gut and fine silver wire. Our only successful cases are those in which we used the silver wire. I cannot explain this unless there is less tissue reaction with silver wire than with other sutures.

Nearly all of our operations have been done by lateral anastomosis except a few rather atypical ones to be mentioned later. Sometimes we find occlusion of the vas at the first incision, and by going further up the vas we are able to get above this obstruction. Care is exercised to cut only into the lumen of the vas; as it is very easy in making this incision to cut through the entire diameter of this tube.

We place the first suture at the distal end of the incision in the vas, taking a good heavy bite as this is the anchoring suture for the operation, and the obstruction is below this point. It is then anchored firmly in the lower end of the elliptical incision in the epididymis. Two lateral sutures are then placed to take a fairly heavy bite and include some of the cut tubules. (If only the fibrous covering of the epididymis is taken up the cut tubules drop back when the anastomosis is made.) The suture is then passed through the cut edges of the vas, taking just enough tissue to approximate the edges. The last suture is then passed in the same way through the upper end of the incision in the vas, being carefully placed so as not to occlude the lumen. The anastomosis is then complete.

We can tell sometimes by examination before operation if the case is inoperable. Such cases on palpation of the vas show distinct beading. These are nearly always occluded and therefore inoperable as regards cure.

We all know that in operating upon a spermatocele unless we remove every part of the sac, which means the removal of the small duct that leads into the spermatocele, we are liable to a recurrence of the spermatocele. It is probable that this same condition obtains in the cases where we get a cure, namely, that a sinus is formed between the incised vas and one or more tubules in the epididymis that acts in the same way as the duct that leads to a spermatocele.

A failure at one time, if the vas is patulous, is no contraindication to asecond operation, as in some of our most successful cases we have had a failure the first time with successful outcome at the second operation. The time of the appearance of the spermatozoa varies. We have had patients that have had actively motile spermatozoa one month after operation, others varying from one month to one year. We do not reoperate these cases under one year as we have had successes that did not manifest themselves until eight or nine months after operation. In 1 of these cases the first evidence of cure that the patient had, was that his wife became pregnant. He was in a rather unhappy frame of mind until we found he had thousands of spermatozoa.

Before operating we have made repeated examinations for spermatozoa, or else repeated examinations have been made by the surgeon referring the case, that were negative. Some have been sent to us for sterility that were not sterile so I feel we have to be careful in diagnosing sterility where too frequent demands have been made on the secretion just before examination.

I have not tried the methods advanced by Lespinasse of dissecting out a single tubule and implanting it with removable suture. Of course both ends of the tubule have to be planted, otherwise we would not know which was the afferent or the efferent end as the mere presence of spermatozoa would not tell us this. It seems to me that there is probably a better chance of a sinus between the vas and the epididymis forming where we have dozens of tubules cut across than if we rely on only one. It has occurred to us the advisability of leaving for a short time a piece of wire or silkworm gut in the vas that could be removed in a few days after the operation, but any interference of this kind tends to make for the formation of cicatricial tissue at the point where we want to minimize its occurrence and it is probably the slight reaction that the tissues have to a very fine silver wire (proven experimentally) which makes for the success of this operation.

It is most important to control all bleeding before making the anastomosis. We have always done a bilateral operation, giving us a double chance for a cure, as this does not interfere with a subsequent operation if a failure occurs.

I am giving a report on only 21 cases as our records for five years were destroyed in a fire in the record room at the hospital, and we are not able to get accurate data during this time. As near as we can estimate we have operated on 40 patients. Of the 21 reported there have been 28 operations. Seven were reoperated on account of initial failure. Of this number, 3 were cured by the second operation where we failed in the first. We have had two 2 patients in which we found in the epididymis of one side motile spermatozoa with an occlusion of the vas on this side; the vas appearing as only a fibrous cord. On the opposite side we found no spermatozoa in the vas but the vas was patulous. A crossed anastomosis was done—that is, the patulous vas was brought through the scrotal septum and anastomosed to the epididymis that contained the live spermatozoa. I have been very anxious to obtain a success in this type but unfortunately both failed of cure.

We have had 1 interesting case in which one side showed no spermatozoa in the epididymis. On the opposite side the globus major was replaced by a small spermatocele. An anastomosis was made between the vas and the spermatocele. This patient had live spermatozoa within six weeks after the operation. This was done six months ago and I have not heard as to pregnancy.

We have made anastomosis directly into the testicle with no result. The total number reported was 21. *Three* patients had either double occlusion of the vas or else bilateral absence of spermatozoa in the epididymis (14 per cent of 21). *Eight* patients in which no occlusion was found and in which active spermatozoa were found failed of cure. This includes 2 crossed anastomosis cases (38 per cent). *One* patient in which result is unobtainable. *Eight* cured (38 per cent of total number reported). If we eliminate from this reckoning the 3 patients discovered to be inoperable at exploratory operation by reason of occlusion of the vas or absence of spermatozoa in the epididymis, it shows 50 per cent cured. Five of the eight operatives cures begat one or more children.

The operation while tedious is not dangerous to life although we have always used a general anaesthetic. It cannot compromise the function of an organ that has already proved functionless. The only chance of recovery of a patient with sterility due to occlusion of the epididymis is operation to overcome the occlusion.

THE IMPORTANCE OF EARLY DIAGNOSIS IN TUMORS OF THE SCROTUM

J. DELLINGER BARNEY

It has long been realized that it is difficult and often impossible for even those of the greatest experience to arrive at an accurate diagnosis in scrotal tumors. The possibilities of error are innumerable and I personally do not believe that any one is infallible.

I wish to report in detail the following cases as they illustrate first, the difficulty of making a correct diagnosis, second, the extreme importance of arriving at this diagnosis at the earliest possible moment, third, the wisdom in any doubtful situation of exploration of the scrotal contents.

Case 1. W. E. F., thirty-two years old, seen in consultation with a surgical colleague in July, 1912. The patient had been suspected of having lung tuberculosis for years, although the tubercle bacillus had never been found in his sputum. He had always lived and worked under the very best of hygienic conditions, but was always underweight and a semi-invalid. During the past ten years he had lost about 20 pounds in weight. For years he had had to urinate once at night. A few days before I saw him he had noticed a hard lump in the right side of the scrotum. This was moderately tender and painful. Frequency of urination somewhat increased day and night, with moderate urgency, but no dysuria. Examination showed a spare and sallow young man. The right epididymis was much enlarged, indurated and tender, especially at the upper pole. The sulcus between it and the testicle was not distinct. The vas was moderately thickened, rather firmer than normal and there was slight tenderness in the right groin. The left side of the scrotum was normal. The prostate felt normal as did the left seminal vesicle, but the right seminal vesicle was definitely indurated and rather nodular. The urine was slightly hazy and contained a few leucocytes. The surgeon had already made a diagnosis of tuberculous epididymitis and I concurred in this diagnosis,

not only on account of the local, but also on account of the general condition of the patient. I advised immediate epididymectomy. The surgeon objected to this on the grounds of a mortality of about 2 per cent and instead recommended further hygienic measures combined with tuberculin. This treatment was carried out under the ideal conditions obtaining at Saranac Lake, New York. The patient gained over 10 pounds in weight and his general condition greatly improved. On the other hand, the scrotum steadily increased in size. At the end of eight months the surgeon performed an orchidectomy, which revealed a new growth of the testicle. Dr. J. H. Wright, Pathologist at the Massachusetts General Hospital examined the specimen and reported as follows: "The tumor tissue consists essentially of rather large, round, vesicular-nucleated cells and a connective tissue stroma. The cells in places are arranged in ill-defined groups and masses in the stroma, which is in general relatively small in amount as compared with the cellular elements. I consider the tumor to be malignant and I would call it a round cell sarcoma." The specimen was subsequently sent to Prof. James Ewing of Cornell University, who said: "It is a typical large round cell sarcoma of the testis. Chevassu would, I think, at once recognize it as his "Seminome." I regard it as an embryonal carcinoma and a part of a teratoma which has overgrown all other elements. . . . . I fear that the prognosis is very uncertain; it depends upon the size and encapsulation of the growth. I have seen recoveries after operation in early cases." No trace of tuberculosis was found by either of these pathologists, nor was any mention made of the condition or even of the presence of the epididymis. The patient made a good recovery from the operation but died about two years later of internal metastases.

Case 2. G. G., nineteen years old, seen by a well-known urologist in September, 1918. When about five years old the patient had a swollen gland in the neck which persisted for some time but finally subsided. He has grown extremely rapidly and evidently has little resistance to infection. He had acute parotitis a year ago with left orchitis. Last winter (1917), while in the Aviation Corps he had a severe tonsillitis with general infection, followed later by what was apparently appendicitis. Operation was performed and a moderately inflamed appendix removed. During the operation it was noted that there were several large mesenteric glands, which in themselves might have accounted for the abdominal symptoms. Shortly after this operation

there occurred an acute infection of the right scrotum. The patient was seen by a urologist who thought at first it was an involvement of the testicle. The symptoms gradually subsided, following which the patient had an attack of measles with good recovery. The condition of the right scrotum had varied from sub-acute to chronic but was now quiescent. No urinary symptoms; urine said to be negative. Patient's general condition had been improving owing to a persistent out-door life. Had been under observation continuously by a competent internist who found no evidence of lung tuberculosis. Examination showed a very tall, thin, overgrown boy. Abdomen negative. Left testicle markedly atrophied. Right scrotum size of goose egg, tense, elastic, slightly tender, said to be translucent and had been tapped once with the evacuation of a small amount of fluid. Posteriorly there was a marked enlargement of the epididymis, which was indurated and nodular. Vas apparently normal. By rectum there was a little thickening of the prostate and vesicle on the right side, but nothing abnormal noted on the left. Here again I concurred in the diagnosis of tuberculous epididymitis. I advised immedate operation as in the previous case, but here also the surgeon believed in the efficacy of palliative measures. These were carried out, but as the scrotal tumor continued to increase in size, the patient consulted a third surgeon who advised and performed orchidectomy in October, 1919, eleven months after being seen by me. The specimen was examined by Dr. J. H. Wright, who said: "The testis is enlarged and about 9 cm. in its greatest dimension. The epididymis is stretched over its surface. On section the testicular tissue is extensively spread out over an encapsulated tumor. The tumor is composed largely of a soft, whitish to yellowish tissue, the latter being necrotic. In places there are small cysts and small masses of bony or cartilaginous tissue. The gross, as well as the microscopical appearances of sections, show that the tumor is a combination of 'embryonal carcinoma' and teratoma elements. The carcinomatous element is not, as was at first thought, like that of the common malignant tumor of the testis. Better sections show the carcinoma element to have a more complicated papillary adenomatous character. In view of this finding, I think the prognosis may be more hopeful." This view has so far prevailed, as the patient is living and in excellent condition, nearly five years since operation. Whether or not this happy outcome was influenced by two X-ray treatments which the patient received after operation is difficult to state.

Case 3. W. G., thirty-two years old. Admitted to the Massachusetts General Hospital January, 1924, with a diagnosis of pulmonary and genito-urinary tuberculosis. Seen in consultation with Dr. Hugh Williams. Patient said he was a "bleeder" and that after tonsillectomy twenty-two years ago, "he nearly bled to death." Fifteen years ago he had a compound fracture of the elbow and when the dressing was removed there would be a "gush of blood." Has had recurrent epistaxis since the age of eight. Two teeth were extracted some time ago, at which time he bled so severely that the cavities had to be packed. The family history contained no evidence of tuberculosis or hemophila. Three years ago patient began to have sharp, stabbing pain in the right testicle, radiating to the groin and back, and accompanied by swelling of the testicle. Just before the onset of these symptoms the patient received a slight injury to the testicle. The pain had been periodic and progressive and aggravated by over-exertion. Relieved by rest in bed and by heat. No urinary symptoms. Patient had been hoarse for four years and a diagnosis of tuberculosis of the larynx had been made. There had been marked dyspnea for a year but no cough or hemoptysis. Occasional night sweats. There had been a gradual loss of weight during the past four years. Patient came to the Hospital because of the severe pain in the right scrotum. Examination showed a poorly developed and nourished young man who is very hoarse. Just above the clavicle there was a hard, movable gland the size of a walnut. The right scrotum was the size of a goose egg, tender and hard, the epididymis swollen and nodular, with a general thickening suggestive of testicular involvement. Further examination by me showed the prostate essentially normal, the right vas deferens much enlarged, the right seminal vesicle slightly indurated. Abdominal examination was negative. All urine examinations were negative. Examination of the chest showed signs which were compatible with tuberculosis, but unfortunately no radiographs were taken. After a good deal of study and disagreement by and among various members of the medical staff, with reference to the question of hemophilia, it was finally demonstrated both by Drs. C. M. Jones and George Minot, that the case was one not of hemophilia, but of chronic purpura hemorrhagica. Although I had committed myself to a diagnosis of tuberculous epididymitis, with involvement of the testicle, I advised against operation in view of the purpura. The patient was, however, so insistent on operation that orchidectomy was performed by Dr. Hugh Williams, transfusion being done as a preliminary measure two days previously.

Great care was taken to check all bleeding during the operation. Convalescence was slow and complicated by several severe hemorrhages and almost constant capillary oozing. During this time the patient was transfused twice, with 200 cc. and again with 500 cc. of whole blood (group IV). Hemorrhage finally ceased, the wound closed and the patient was discharged on March 14, two months after admission. The pathological examination made by Dr. H. F. Hartwell, showed the following: "Solid tumor, size of tennis ball, with a portion of the spermatic cord. On section it shows a lobulated, grayish-white surface, with areas of purplish red softening. Microscopic examination shows clusters of large undifferentiated cells, arranged in indistinct alveolar clusters. They have hyperchromatic nuclei with many mitotic figures. There are large areas of necrosis. Diagnosis, embryonal carcinoma." Unfortunately no mention is made of the epididymis. While so far as I know the patient is still alive, I now believe it possible, as I review the case in retrospect, that the condition of the chest, throat and testicle were due to one and the same cause, namely, new growth with metastases.

While it seems improbable that cases similar to those just reported are unique, they are certainly but rarely recorded in the literature, nor are they familiar to any of the pathologists, urologists or general surgeons with whom I have discussed the matter. Barringer and Dean (Jour. Amer. Med. Assoc., 1921, lxxvii, 1237) have, however, seen two similar cases. In discussing them they say:

> The tumors arise with rare exception, from sex cells situated in the rete testis and the teratoma may develop either toward the testicle and epididymis, involving both in a large tumor mass, or much more rarely, toward the epididymis, forming a typical tumor of the epididymis.
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> Notwithstanding the situation of testicular tumors, making them easily accessible to palpation and observation the diagnosis is often difficult. One of us vividly remembers doing an operation for hydrocele and noting at the time of operation that there was what we took to be an inflammatory change in the epididymis. The patient left the hospital healed. He went to another hospital a month later where a teratoma testis was removed.
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> We have seen two cases in which the teratoma grew atypically and involved the epididymis alone, giving a picture not unlike tuberculosis of the epididymis.

In a personal communication to the writer, Prof. James Ewing says:

It occurs to me that you have been meeting your cases of carcinoma of the testis very early, before the tumor has involved much of the testis. These tumors do not begin in the testis, but in the rete and in the early stages there is as much of the growth in the epididymis as in the body of the testis. Later they expand and push the testis before them or invade it more or less. I have one early case in which the tumor is more in the epididymis, near the rete than in the testis. . . . . The origin in the rete and tendency of some tumors to invade mainly the epididymis and cord has seemed to me to favor the view that these typical embryonal carcinomas are not seminomes, as Chevassu claims, but one-sided teratomas. . . . . I know of no tumors which originate in the structures of the epididymis, strictly speaking. . . . .

That my experience in mistaking an early neoplasm of the testicle for tuberculosis of the epididymis is not unique, is shown by Hinman (Cabot's Modern Urology, second edition) who says:

Tuberculosis more rarely presents difficulties and only in those rare instances of massive tuberculous epididymo-orchitis. The epididymis is the seat of primary election to tuberculosis, and the disease produces characteristic nodulation as it progresses. Mistaken diagnoses are possible, however, as the writer can testify, having both performed a radical operation for tuberculosis and delayed another in seminoma, thinking it was tuberculosis. Mistakes occurred in both cases after gross inspection, following orchidectomy and in consultation with an expert pathologist. It was only after careful microscopic study later that an exact diagnosis was made.

In regard to primary tumors of the epididymis Hinman and Gibson in their recent masterly paper entitled "Tumors of the epididymis, spermatic cord, and testicular tumors." (Arch. Surg., 1924, viii, no. I, Pt. I, 100) which includes a review of the entire literature of the subject, say in their conclusions

As regards tumors of the epididymis sarcoma is again the most frequently occurring neoplasm, and at least ten authentic cases have been reported. Only 1 case of lipoma is reported, the reason probably lying in the fact that the epididymis normally contains no fat. Six cases of leiomyoma and 4 cases of carcinoma, including a personal case may be considered authentic.

Teratoma of the epididymis does not occur, judging from the paucity of the literature of the subject. We have but the single instance recorded by Barringer (Internat. Jour. Surg., 1920 xxxiii, 116) of a true teratoma occupying the entire epididymis with extremely little encroachment on the testicle, although Bland-Sutton (Lancet, 1909, 1406) has reported a teratoma arising between the testicle and the epididymis. It is the belief of the latter that testicular tumors arise from the paradidymis. The consensus of opinion as expressed by Ewing (Neoplastic Diseases, 1921, 779) is that testicular tumors arise in the rete testis. It is therefore probable that in the case of Barringer the point of origin was the same as for teratoma testis, but for some unknown reason the propagation was primarily into the epididymis rather than along the customary route into the testis.

It would appear therefore, that neoplasms originating in the epididymis although rare, certainly do occur; it is also apparent that tumors originating in the testicle may and sometimes do involve chiefly the epididymis especially in the early stages, and give rise to symptoms simulating a subacute or chronic inflammatory process, such as tuberculosis.

That this deceptive trait is not confined to one class of tumor is shown by my 3 cases, of which one was a sarcoma, one an embryonal carcinoma, and one an embryonal carcinoma combined with teratoma. Hinman's testimony, as well as that of Barringer only confirms these statements, the fact that the patient with such a tumor of the scrotum may have active tuberculosis elsewhere only adds to the confusion.

In view of this evidence I am of opinion that where there is any doubt whatever as to the diagnosis an immediate exploratory operation should be advised. The fact that such an operation on the scrotum can be done under local anesthesia, that it involves but little confinement to bed, and that it is practically, if not actually without mortality fully justifies the procedure, especially when, as is well known, an error in diagnosis may be so costly.

ATYPICAL CASES OF SUBMUCOUS CYSTITIS

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In 1914 Hunner called the attention of the profession to a form of chronic ulcerative cystitis, previously unrecognized as a definite type of bladder disease.

Upon reviewing the older literature, two masterly descriptions of this lesion are found. Kelly describes very typically submucous cystitis in an advanced stage and gives an illustration of the cystoscopic picture taken from a case in 1897. His observations were exceedingly accurate, but it was classified with cystitis in general. Nitze gives a classical description of this lesion, terming it "cystitis parenchymatosa."

Submucous cystitis has a marked tendency to repair with the formation of cicatricial tissue and often in cases of long standing the most striking feature of the cystoscopic picture is the distortion of the contour of the bladder by contracted ridges of white scar tissue. This the older writers described, but overlooked the cases with smaller early lesions which Hunner observed.

Hunner's descriptions of the "elusive ulcer" were undoubtedly drawn from pure, uncomplicated types of the disease. Emphasis was placed upon the clear sterile urine, showing but a few pus and red blood cells upon careful examination of the centrifuged sediment. No complicating lesions of other urinary organs were described, excepting a very constant occurrence of granular urethritis, and more recently a 50 per cent incidence of ureteral stricture.

In the past ten years many competent urologists have studied the disease and much valuable data has been obtained.

The location of the lesions, cystoscopic picture and the microscopic findings of excised tissue are agreed upon by all observers. This seems sufficient to establish a disease entity.

Nearly every observer reporting a series of cases has found atypical features in one or more instances, some having a considerable amount of pus and red blood cells in the urine. So wide a variety of bacteria have been cultured from the urines. that contamination or secondary mixed infection must be assumed. Why, this being the case, cannot the typical picture and cardinal symptoms for diagnosis laid down by Hunner be materially altered and the submucous cystitis present be obscured?

Most of my cases have given a history of one or more attacks of acute cystitis with recovery, occurring several years before the onset of the insistent chronic symptoms of submucous cystitis. Six of 10 cases observed conformed strictly to the classical description of Hunner, 8, upon resection yielded tissue of typical pathological change. Four cases have atypical features which I wish to report in brief.

Case 3. Woman, aged forty-eight. Severe general cystitis, granular urethritis, pyuria, colon bacillus on culture. Kidney urines sterile and contained only occasional leucocyte. Instillations of silver salts and mercurochrome for several weeks restored all of the bladder walls to normal, except areas in vertex and right posterior wall which showed typical lesions of submucous cystitis. This failed to respond to fulguration and topical application—all foci were investigated and removed and later partial cystectomy performed.

Case 5. Male, aged thirty-two. Severe general cystitis, right infected hydronephrosis and hydroureter, left pyelonephritis. Marked pyuria. Treatment—right nephroureterectomy. Left pyelostomy with daily lavage. Pyelostomy allowed to close but bladder symptoms persisted in spite of normal left kidney urine and repeated bladder instillations. Cystoscopy showed bladder walls contracted and trabeculated. Circumscribed area of submucous cystitis posterior to vertex. Treatment—wide resection of this area and division of internal sphincter on floor. Result cure.

Case 8. Woman, aged twenty-eight. Onset acute trigonitis with leucoplakia under my care for several months with apparent cure. One year later right nephrectomy done by general surgeon—patholog-

ical report showed no abnormalities of kidney. Returned to my care one year after operation and extensive area of submucous cystitis found on anterior wall of bladder. Had rheumatism. Tonsils removed and teeth repaired. All local treatment of bladder unavailing over period of one year. Wide resection of involved area. Result cured to date.

Case 10. Woman, aged thirty-five. Severe general cystitis, bilateral strictures of ureters and pyelonephritis. These cleared up with treatment but an area of submucous cystitis was found on posterior wall of bladder which has resisted all treatment including fulguration and local applications.

Of the 4 all but case 10 have been resected and are included in the 8 in which tissue removed showed typical changes. Case 10 is still under treatment having just had tonsils removed and teeth put in repair.

I believe these 4 cases with other atypical ones reported prove there may be variations from the classic description of Hunner which belong to this definite disease entity.

Many cases will undoubtedly be overlooked unless a search for areas of submucous cystitis is made after symptoms fail to disappear when more obvious disease has been eliminated.

Reports of various operators show a recurrence of symptoms of original severity in twenty to thirty per cent of operated cases. It behooves one to use every measure to combat the disease before resection is practiced.

Some of the cases showing permanent improvement may be converted to cures by treatment of the granular urethritis so commonly associated with this disease. Four of my operated cases, apparently only partially relieved, but showing no return of the ulcer resumed a normal interval of urination after a course of urethral dilatation and instillation.

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REPORT OF A CASE OF RETRO-VESICAL ECHINOCOCCUS CYST

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The patient was a Greek male, aged twenty-four, and had been living in this country since the age of sixteen. He was first seen by me on January 18, 1919, at which time he was admitted to the Hospital on account of a typical chancre and early secondaries. Spirochetes were found and the Wassermann was positive. The urine at that time showed considerable albumen and both hyaline and granular casts. He gave a history suggesting scarlet fever in childhood with resulting acute and chronic nephritis. There was also a history of acute gonorrheal urethritis in 1917, lasting probably something more than two months. The physical examination at this admission was practically negative other than for those findings that you would expect with early secondaries. The rectal examination showed nothing abnormal. There were no urinary symptoms.

He was kept on intermittent anti-luetic treatment for three years. The Wassermann was negative in six months after the beginning of treatment, but at no time were we able to push the treatment on account of the kidney condition.

In May, 1922, he was seen with another acute gonorrhea, which lasted in the neighborhood of two months. In August 1922, his anti-luetic treatment was discontinued and at that time he was complaining of no urinary symptoms other than what might be attributed to the gonorrhea from which he had just recovered.

In January, 1923, he returned for another Wassermann and at this time he gave a history of some frequency and of increasing difficulty in voiding. The difficulty was more marked than the frequency. Two months previous he had what was apparently acute retention and was catheterized but he did not think that a very large quantity of urine was obtained. There was relief, however, from his symptoms for a short time and then they returned and gradually increased. He was able to pass the urine only after a great deal of straining and in a very small stream. There was no burning or smarting or terminal

tenesmus, and he had a feeling that he never completely emptied the bladder. There was constant distress in the lower abdomen.

Examination showed a tumor of the lower abdomen extending from the symphysis nearly to the umbilicus. It had every appearance of being a distended bladder and with the history of two gonorrheas a diagnosis of stricture was made. The patient with much straining was able to pass a small quantity of urine containing albumen and a few casts and a few pus cells. The rectal examination immediately after this showed the prostate to be pushed down by the mass, but to be quite normal as to size. Its limits could be easily made out. A No. 18 French coude catheter passed quite easily into the bladder. There was some difficulty in passing it through the posterior urethra, but no stricture was found. There was about 150 cc. of clear residual urine. The emptying of the bladder did not materially change the size or the position of the abdominal tumor. The day following this examination he reported that he had voided with much less difficulty. He was again catheterized with a No. 24 silk catheter and no residual urine was found. The bladder was filled to capacity and was found to hold about 250 cc. The size and location of the tumor did not materially change with the filling or emptying of the bladder. Rectal examination again showed the prostate to be below the mass. With a finger in the rectum and a hand on the abdomen the mass could be distinctly felt extending completely through. Pressure from the abdominal hand could be distinctly felt by the finger in the rectum and vica versa. There was no tenderness or pain on palpation. The impression that one got from examining the tumor between the two hands was that it was more cystic than solid, although it was very firm. No type of a cystoscope could be passed. A cystogram showed the bladder pushed to the left and forward and the anterio-posterior shadow was half-moon shaped, the fundus of the bladder being pushed downward. The remainder of the examination and laboratory findings were negative. No evidence was obtained of any liver enlargement and the kidneys could not be palpated.

A diagnosis of retro-vesical pelvic tumor—probably cystic—was made and exploratory abdominal operation was advised. This was done on January 22, 1923, by Dr. H. L. Beye and myself. The findings were as follows:

A midline incision from symphysis to the umbilicus was made. The abdominal cavity was opened.

A tense walled cystic tumor was found to occupy the lower portion of the bladder coming out of the pelvis. It filled the pelvis and extended to the level of the umbilicus. Its wall was smooth and almost blue in color. When the bladder was distended by fluids there was no change in the size or position of the tumor. It was covered by peritoneum and there were adhesions between its peritoneal investment and the omentum and two or three sigmoid appendages. It had displaced the bladder forward and to the left.

A needle was passed into the cyst and a colorless thin fluid obtained. The trocar was then inserted and a considerable portion of the fluid content drained off. Some of the fluid escaped into the field of operation and was mopped up.

An incision was now made through the peritoneum at the junction of the tumor and the bladder and carried on each side to the pelvic brim. The tumor was then dissected from its bed. This was easy and accomplished by finger dissection and by cutting with the scissors. On each side the ureter was isolated and stripped from the region of the tumor. The ureters were displaced laterally by the tumor. There was no evidence of any dilatation of the ureter. The retro-sigmoid was carefully freed from the capsule of the tumor by finger dissection. It was then possible to insert the hand into the pelvis keeping close to the tumor wall and it was enucleated from its pelvic position.

The bleeding from the connective tissue bed in which the tumor had lain was very slight. The tumor did not seem to have any point of attachment to any viscera or other structure. The peritoneum which had been split and stripped back from the tumor was now sutured leaving one cigarette drain leading into the pelvis. The abdominal incision was closed in the usual manner.

While the operation was long and tedious the patient left the table in good condition. There seemed to have been no gross displacement of any of the abdominal or pelvic viscera by the operative procedure.

Hooklets were found in the fluid from the cysts. The cystic sac had a wall two or three millimeters in thickness and quite fibrous. The thin membranes were easily stripped off from the cystic wall. The capsule shows hard, greyish white areas,—apparently scars of former ruptured cysts. Inside of the sac a typical echinococcus cyst was found. The wall of the latter is about 0.4 cm. thick and very friable. Inside of this cyst numerous daughter cysts were found. These daughter cysts were mostly broken down due to handling during the operation.

The patient made an uneventful recovery. Difficulty on voiding immediately disappeared and never returned.

At the time of operation the upper abdomen was not explored and the liver was not examined.

In June, 1923, he complained of some distress in the upper abdomen, but nothing could be found. He was watched for several weeks. The symptoms disappeared. Late in 1923, the same symptoms returned and in February, 1924, when the patient was again seen a distinct tumor could be palpated in the liver region and a diagnosis of echinococcus cyst of the liver was made. He went to Rochester and the diagnosis was confirmed by operation by Dr. C. H. Mayo, who removed on March 12, 1924, a hydatid liver cyst about the size of a child's head.

The patient has made a very good recovery from this last operation and is now in good health, with the exception of having a positive Wassermann on the spinal fluid.

A review of the literature of retro-vesical hydatid cyst shows that while it is a rather rare condition it does occur frequently enough in those countries where echinococcus disease is endemic to cause physicians to be on the lookout for it. In America it is quite rare, but should be kept in mind when dealing with the foreign-born. A total of about 116 retro-vesical echinococcus cysts are in the literature and Deming in July, 1923, in reporting a case of retro-vesical echinococcus cyst with acute retention of urine made such an excellent review of the literature that very little need to be added to it. He abstracts a total of 48 cases, including his own, in which the cyst had produced acute retention and mentioned finding a total of 114 cases. I think I have found 3 cases not mentioned by him. Not included in his abstract is a very interesting case reported by Plaggemeyer and Cuming, reported at about the same time showing acute retention.

There is a striking similarity in the symptomatology of all the cases reported, although the exact diagnosis is very seldom made before operation or autopsy. The condition occurs six times as frequently in the male as the female and is largely confined to middle-aged being seen rarely in the very young or the moderately old. One case at the age of seven has been reported.

The symptoms are all the result of pressure on pelvis structures and the damage is secondary thereto. The cyst in itself

is negative in its symptoms. The symptoms in the female, of course, will vary considerably, but in the male all of the cases give practically the same history. The bladder neck in front and the sigmoid and rectum behind are compressed by the enlarging tumor. In some of the cases reported ureters are also involved and hydronephrosis unilateral or bilateral results. In 4 cases cysts were found in the bladder cavity and in 3 of these there was quite definite evidence that the retro-vesical cyst had ruptured into that organ. In the fourth case the patient also had an echinococcus cyst of one kidney and the bladder cyst may have been secondary to that. In 1 case reported the cyst evidently developed in the prostate, as prostatic tissue was found in the sections of the cyst itself. In practically all of the other cases the cyst did not directly involve vital structure. The serological test was used in a few of the later reported cases and apparently was quite reliable, but it was seldom available.

In brief it can be said that any pelvic cystic tumor in the male should be suspected of being an echinococcus tumor.

As to treatment aspiration or any such procedure carries with it too much danger and too little benefit to allow it to be considered. The treatment of choice is open operation by the suprapubic approach with complete excision of the cyst if possible, and if that is too difficult, then the suturing of the cyst wall to the skin and the treatment of the cyst thereafter with antiseptics.

DISCUSSION

Dr. Arthur L. Chute (Boston): The first cases described in Dr. Barney's paper is, unless I am mistaken, one we saw together. In that case I was completely deceived as to the nature of the trouble; because of the thickening of the epididymis I thought it was probably a tuberculosis of the epididymis, especially as the young man had an operation supposedly for an acute appendix in which the glands scattered through his abdomen had been found to be enlarged and were thought to be tuberculous. One thing that Dr. Barney forgot to mention which added also to the difficulty of diagnosis was that following this man's operation for his supposed appendix it was found necessary to catheterize him, following which he developed an epididymitis; the increase in size of the testis itself was relatively small and was looked upon as a compensatory hypertrophy following an atrophy of the other testis which had come on after an attack of mumps. I have seen a number of these cases of embryoma of the testis before and since, but the one Dr. Barney refers to was most confusing and difficult to diagnose because of the patient's history and because of the relatively little involvement of the testis itself. I agree with Dr. Barney when he says these tumors of the testis ought to be investigated early. There is, however, another side to consider. I had the misfortune, before the days of the Wassermann reaction to be sure, to remove a syphilitic testicle that I investigated early because of my fear that I was dealing with a tumor of the testis.

I have an impression that the older people with embryoma of the testis do rather better than Dr. Barney's figures would indicate. Some years ago I saw a man with a tumor of the testis to whom I advised operation strongly. His surgeon removed a tumor which was reported as adeno-carcinoma. Four years later there was no sign of recurrence. Another man from whom I removed an embryoma of the testis in September, 1920,

remains well. These were both adults. On the other hand a boy of eighteen from whom I removed an embryoma died of recurrence in ten months. I believe when these growths recur that they recur early, that a man who shows no evidence of recurrence a year after operation is unlikely to have a recurrence.

Another thing that has been brought out by my experience is that there is little advantage to be obtained by making an extensive dissection of the glands. The careful removal of the tissue with the cord and any glands that may be present up to the external ring seems to be as efficacious as a tremendously wide dissection.

Dr. JOHN H. CUNNINGHAM (Boston): I would like to say a few words in regard to Dr. Hagner's paper. The practical features which he has brought out in regard to possible relief of sterility are very valuable. His technique and results I believe are the best that we have today. He has emphasized what I think very important to these cases, which is, that they should always be carefully studied before the operation is undertaken.

In several instances of sterility which I have observed, due to inflammation of the prostate and seminal vesicles, treatment directed to eliminating the inflammation in these organs has resulted in the reappearance of spermatozoa in many, but without their reappearance in others.

In some instances where the spermatozoa have been present but inactive or deformed, there has been improvement by elimination of the inflammatory condition of the prostate and seminal vesicle, and it is my belief that only those cases in which spermatozoa cannot be found, after eliminating chronic prostatis and vesiculitis, should be subjected to operation.

The point I wish to emphasize is that in the presence of inflammatory changes in the prostate and seminal vesicles, associated with asospermia, these organs should be relieved of their inflammatory changes by palliative measures, before the operation described by Dr. Hagner should be undertaken.

Another point which I did not hear Dr. Hagner mention is that I do not believe any decision in regard to sterility should be made from any material except from a condom specimen.

The technique of operation which we have carried out is essentially that presented by Dr. Hagner. I have used both silver and catgut as suture material, without any apparent better results with one than the other. My results, in regard to relieving sterility, are not as good as Dr. Hagner's, and I have no doubt that in view of his strong perference for silver wire, it should influence us in adopting this suture.

During the operation the most difficult feature, for me, is to control hemorrhage. Dr. Hagner has laid no stress on this, but I have felt, myself, that in my failures the most important factor might well be the ooze which may block the small lumina, become organized, and result in stenosis, with resulting operative failure.

Dr. NATHANIEL P. RATHBUN (Brooklyn): I would like to emphasize one point made by Dr. Paine, and that is the importance of considering the possibility of stricture of the ureter as a complicating factor in ulcer. We have had 3 such cases in the last year, 2 bilateral and 1 unilateral. Two have been fulgurated, 1 by myself and 1 by another urologist, with slight relief of symptoms. One case was a woman who had been urinating once an hour, day and night, and had been doing so for a period of years. She had to abandon all social activities. Shortly after her dilatation she was urinating once or twice each night, she was able to go to the theatre and to enjoy herself, and, as she said, she began to live again. That state of affairs continued for five months, and then she had a recurrence of symptoms and we dilated her again last week; and we expect improvement again.

I think this factor is so important that I am convinced we should look for stricture of the ureter in every case of elusive ulcer.

Dr. BENJAMIN S. BARRINGER (New York): Dr. Hagner has the best statistics in the world on sterility. One point strikes me in cases that persist, and that is finding both vas patent about up to the prostate and there strictures. If he does not inject something into the vas to see if it is patent then this condition will not be recognized.

Deep X-ray is very valuable in the treatment of teratoma testis. In our hands it has been marvelous to see the change from either radium pack, or deep X-ray therapy. We have had two cases with large abdominal metastasis that have gone down after radium pack and have kept well for over five years.

I think Dr. Barney has done a good thing in calling attention to these failures of diagnosis. I had a similar experience. I operated a case at Bellevue, took the testicle out, examined what I thought to be an epididymis, and put it back again, and the case went to another hospital where a teratoma was removed.

Dr. JAMES A. GARDNER (Buffalo): I think Dr. Hagner's results would be better if his friends exercised more care in the selection of the cases they send him. I referred one case whom I was as anxious to be rid of as I was to have him cured. We see many of this type. The patients are not wholly normal, and I think if Dr. Hagner can present statistics as good as these with the class of people that come to him, it means a great deal.

Will the Doctor inform us regarding the length of time that patients were symptom free following the resection of the bladder for an ulcer? One case of mine was symptom free for six weeks when his trouble returned and he was as bad as ever.

Dr. GILBERT J. THOMAS (Minneapolis): I want to report a case of teratoma of the testicle that was operated on about two years ago. That was followed by deep therapy for six or eight months, and the patient is apparently well now.

I think we are to be congratulated on hearing Dr. Hagner's paper on sterility. The difficulty I have is to be sure I have made a correct diagnosis. It is not easy to be sure. I wish Dr. Hagner

would tell us exactly how he determines who is the sterile party and just the way he does it. Working with gynecologists I have treated both male and female, but we do not find as many sterile people as we expect after we thoroughly examine them.

Dr. WILLIAM F. BRAASCH (Rochester, Minn.): There certainly is much confusion existing at present concerning that type of bladder ulcer described successively by Neisser, Kocher and Hunner. The type of localized infection of the bladder which is called panmural fibrosis or sub-mucous ulcer, is being confused with other types of vesical infection. Some observers are using these terms where there is a pyelonephritis and more or less diffuse infection of the bladder mucosa. Some urologists have gone so far as to advise excision of these areas of infection even though pyelonephritis is present. Localized areas of slight superficial infection of the bladder are called sub-mucous ulcer. Frank, simple ulcers of the bladder mucosa are also being called Hunner ulcers. I believe that sub-mucous ulcer or panmural fibrosis is a comparatively rare condition and a very difficult one to cure. Operations for this condition have, in most instances resulted unsatisfactorily after a lapse of six months or a year's time. Sooner or later there is a recurrence of former symptoms, although often not as severe. I am under the impression that as good results can be obtained by other methods, such as fulguration. Bumpus and Meisser have demonstrated the value of the removal of focal infection. Also that ulcers of the bladder of this type are definitely localized and not related to infections higher up.

Dr. ALEXANDER RANDALL (Philadelphia): I wish Dr. Hagner had mentioned in his presentation of this valuable work his method of handling cases where he found the vas occluded above the epididymis, and I wish to ask him to touch on this phase of the subject in closing. Three times I have tried artificial insemination and each time without success. One patient was of especial interest as Dr. Martin had performed some years before, this operation of vasoepididymal anastomosis. On second operation

I found the vas completely occluded by multiple strictures through out its course in the groin: the opposite organ atrophic from infancy. In each of the three attempts at artificial insemination, motile spermatozoa were obtained from the epididymis, mixed with prostatic fluid and injected. I hope Dr. Hagner can add further suggestions to this technique.

Dr. GEORGE R. LIVERMORE (Memphis): In regard to Dr. Hagner's paper with reference to the production of sterility following epididymitis, it seems to me these statistics are entirely too high. It may be that our people work harder for the development of the epididymitis is of very frequent occurrence. In looking back over a practice of a good many years I can remember case after case that developed double epididymo-orchitis who afterwards married and have families. I cannot help but feel that these German statistics are too high, and that the sterility was due to syphilis or some other cause.

As regards elusive ulcer, I have been of the opinion that it is due to infection higher up or probably some systematic condition because in many of these cases after the ulcerative area has been resected the symptoms return. I have a case now, a physician who was operated on at Johns Hopkins about eight years ago and a large area of the bladder was resected. He experienced some temporary relief afterwards, but his symptoms have returned. He has been relieved by fulguration and gradual dilation. So by eliminating infection, dilating ureteral stricture and cleaning up the bladder in a majority of cases we can relieve the condition.

Dr. H. C. BUMPUS (Rochester, Minn.): I am interested in Dr. Paine's patient who had an associated rheumatism. We have seen associated disease of focal origin in many of our patients with sub-mucous ulcers of the bladder. The most striking one was a woman who complained of an attack of acute cholecystitis immediately following the extraction of several abscessed teeth. When the animals injected intravenously with cultures from these teeth were examined, not only did we discover areas of edema in the urinary bladder but the gall bladder of one was

also markedly involved in an acute inflammatory process. Possibly the poor results we have obtained from the treatment of these cases is due to our inability to completely eradicate the original sources of infection.

Dr. FRANCIS R. HAGNER (closing): One further thought about malignancy in tumors of the testicle. It is my impression that the earlier in life these cases occur the more malignant the tumors. We have some cases in older people who have lived many years after simple removal of the growth. Last year I operated on a man who was about twenty-two years old and he had metastasis almost before he got out of the hospital.

Dr. Cunningham asked about the condom specimen. I do not believe it is possible to make a diagnosis of sterility without a condom specimen. We ought to have more than one. The cases I have mentioned where we have not confirmed the diagnosis have been sent most of them by members of this Society, Dr. Keyes and men of that character, who have made repeated examinations before they were sent to us. Otherwise, we have done it ourselves, and if the patient lives in Washington, as the most of them do, we take one specimen, and if we do not find spermatozoa, we wait two weeks and then take another condom specimen, and then in two weeks another. In a majority of cases it is not difficult to tell whether a patient is sterile. They do not have one or two spermatozoa, they have a large number if they have any.

It is most important to control hemorrhage in these cases, and we try to do that without sutures. We use a fine mosquito forceps and stop the operation temporarily until bleeding is controlled. At other times we use traction on the small vessels. If care is not taken to control hemorrhage the anastomosis fills up with blood and there is that much more danger of connective tissue formation, the very thing we want to obviate.

Someone spoke of stricture higher up. That may occur in some cases, but I believe it is better not to inject the vas.

As I said in the paper, I always operate both sides. Some men do not do this, but I think it is better. Some think it

it is better to operate one side and if it is a failure, try the other. If you find live spermatozoa with a patulous vas on both sides, do both at same operation as you have a double chance of cure. This procedure does not lessen the chance of cure at second operation when both sides can again be done. As mentioned before, we have failed the first time and had almost immediate success the second attempt.

Sterility cases usually wait until they are married a few years and do not have children before they find out that they are sterile. The following is a typical case where we failed the first operation. He was operated and in a year had no spermatozoa. He was operated again and in two months he had thousands and his wife was pregnant in four months. He now has two children and one more on the way.

Dr. Gardner mentioned a case that was the worst I every saw. He had no epididymis at all; it was just scar tissue. He wanted me to do artificial impregnation from the testicle, and I did; but it failed. I have done implantation directly into the testicle when the epididymis contained no spermatozoa, but have had no cures.

The determination of sterility I have not covered at all. It is important to be sure that the patient is sterile. Most of these cases have been married a number of years and have no children. You can make repeated examinations and find no spermatozoa. But those cases that have chronic prostatitis will not have an absolute absence of spermatozoa.

Dr. Livermore spoke of the statistics I gave. I believe these German statistics are the best and most accurate we can get, and I do not believe they are too high. He speaks of epididymo-orchitis. They do not have that. Gonorrhea does not cause orchitis. We practically never see an atrophied testicle in gonorrheal epididymitis. It is not an orchitis they have, it is an epididymitis. And I believe if we look over our cases we will find that 40 per cent of those that develop bilateral epididymitis are sterile.

Dr. ARTHUR H. PAINE (closing): I would like to report a case in which I had the same experience some of the men had with tumor of the epididymis. The patient was brought into the hospital, a young man in his twenties, with an acute febrile condition, high temperature and high leukocytosis. A general surgeon opened the abdomen thinking he had a suppurative gall bladder, and found a retroperitoneal mass in the left quadrant, and closed him up. In getting the man's history we found a few months before he had had an acute epididymitis and on examination a typical tubercular epididymis was discovered. We advised removal of the epididymis and to let the mass in abdomen alone. The epididymis was removed and a necrotic space between caput and testis with several little areas that looked like tubercles were found. On section, the laboratory diagnosed sarcoma of the epididymis.

Dr. Gardner asked about the results of this Hunner operation. Ours have been good. Two cases had definite recurrences as proved by the cystascope. I think recurrences are not proved unless you cystoscope the patient and see the lesions still in the bladder. Oftentimes these cases have stricture of the ureters or other conditions that may have occurred coincident with the Hunner ulcer which have been overlooked before operation, and the patients are still suffering from symptoms arising therefrom. I think that may be the reason for some failures. Of my 8 cases I know positively of 4 that are cured—1 since 1919, 2 since 1920, and 1 since 1921. They have normal bladder retention, rise once at night or not at all, and are free from pain.